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IN THIS ISSUE

The October number of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION finds most of the school-shop teachers well on their way into the school year 1938–39. Bearing in mind that frequently eleventh-hour changes are found to be necessary, the articles for this issue have been especially chosen to be helpful for this purpose.

Taking up the problems and projects first, the teachers of woodworking shops will find the following projects not only interesting, but also helpful: Sanding Block, Sandpaper Blocks, Brazing a Band Saw, Cabinet-Key Block, Solar Printing, Workbench for Home and School Use, Pencil Holder, Fiber-Board Scabbard for Cutting Tools, Book Ends, Balancing Girl Shade Pull, Wall Shelf, Kitchen Stool, Modernistic Copper-Trimmed Lamp, Nonsagging Towel Holder, and Swan Letter Holder.

The advanced woodworker will find worth-while projects in the Adam Dining Chair, the Dressing Table, and the Italian Renaissance Floor Lamp.

The drafting teacher also will find the Solar Printing Frame worth considering, as well as the articles on Mechanical Perspective and on Learning to Read the Machinist's Scale. As drafting problems for the student, the details and assembly for the Small Efficient Bar Folder and for the Solar Printing Frame are excellent.

The metalworking teacher will find a Small Efficient Bar Folder, Scroll Bending Jig, Sugar Bowls and Creamers, Copper Candlesticks, Iron Table Lamp, Modernistic Candleholder, Metal Residence Numbers, and Modernistic Copper-Trimmed Lamp both helpful and interesting.

The machine-shop teacher will find the article Learning to Read the Machinist's Scale of assistance in his work. Making the Small Efficient Bar Folder, the Solar Printing Frame details and the Scroll Bending Jig will furnish excellent projects for his students.

The teacher of electricity will be interested in the article on Longer Life for Buzzers and Bells, the Electric Engine, Ford Magneto D. C. Motor, and Multiple Circuit and Variable Speed Flasher.

All shop teachers will derive benefit from reading the article on Safety Rules, and those interested in leatherwork and Boy Scout work will welcome the two plates entitled Let's Each Make a Belt.

Among the general articles, Jos. W. Fleming's "Predicting Trade-School Success — Part I" will be found especially interesting. Those engaged in guidance work will get a great deal out of the study by Hyman Goldstein, entitled "In Again — Out Again." William J. Micheels' "An Industrial-Arts Consumer Unit" contains many helpful pointers to industrial-arts teachers and printshop teachers can gain a great deal by reading what Frank Di Giacomo says on scheduling in his article on "Junior-High-School Printing Classes."

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SHORT TALKS ON WOOD

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←*This is the first of a series of brief articles dealing with various woods, their properties and uses. It is our hope that they might make interesting and helpful classroom material. Your comments will be appreciated.*

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

Predicting Trade-School Success—I

Joseph W. Fleming

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The first part of a study submitted to the University of Pittsburgh in partial fulfillment of the requirements for the degree of doctor of education. The material practically as published here has also appeared in "Pittsburgh Schools," published by the Pittsburgh Board of Public Education.

The selection of boys who may become successful apprentices and journeymen in the trades presents a problem of major importance to the individual, to society, and to the trade or vocational high school.

To the individual, a wise choice of a vocation may mean the difference between success and failure, happiness and discontent. One of the problems of our schools is to aid the student to discover those capacities, aptitudes, and interests that he possesses, to the end that he may utilize these to the best advantage when seeking training and employment. The life span of an individual at best is short and the employment span is becoming shorter; it is, therefore, to his advantage to find the vocation that gives him a reasonable amount of happiness and comfort, with a minimum of delay and disappointment.

The elimination of boys who will fail to meet the requirements of the full-time vocational school should reduce the number of drop-outs, reduce the damage to equipment, reduce accidents, and increase the efficiency of the training program.

The present plan of admitting students to the Clifford B. Connelley Vocational High School is selective to the following degree. Any boy, 14 years of age or over, having completed the 8A grade and who is physically capable of profiting by the vocational-high-school instruction is permitted to enter. It is assumed that having passed the 8A grade, his intelligence is sufficient for admission to some of the courses taught, if not to all of them.

His choice of trades is largely his own, guided somewhat by the following: A visit to the vocational high school, an interview with the vocational counselor, possibly some parental guidance, readings of a guidance nature, and the advice of friends or fellow students. If the trade of his first choice is filled to capacity, he is given an opportunity to make a second choice, and if this is filled, then a third choice, with the understanding that when a vacancy in the trade of his first choice does occur, he is transferred to the shop where his trade is taught.

This plan for admitting boys makes no provision for eliminating at time of entrance, those who have little or no aptitude for trade work, nor those with a level of intelligence that seriously interferes with success in their chosen trade. The previous school records have not been utilized to the fullest, because we do not know what predictive values they may have in guiding the boy into the trade or trades that best match his knowledge, skills, and interests.

The Problem of Selection

The practical problem faced each semester lies in the following situation: A greater number of boys seek admission to the same school shop than can be accommodated. This places the problem of selection immediately before the administrators, in this case the vice-principal and the vocational counselor. What criteria are available at the time of entrance that will aid in selecting from the large group applying, the best prospects to fill the number of vacancies in the shop of their first choice?

Each year the Clifford B. Connelley Vocational High School admits between 500 and 600 boys in September and between 200 and 300 boys in February with another 100 more or less coming in at other times during the year. One can readily see that in handling these numbers, any plan of selection should be of the kind that can be administered quickly and at a reasonable cost.

In searching for an answer to the question of selecting pupils, many studies were reviewed. These studies show differences in their findings, indicating that the field is still open for further study and that much work is yet to be done in the field of counseling.

Thorndike[1] in his study of 2,225 children, 13 years of age and up, summarized his findings as follows:

"That the prediction of future marks in school are weak.

"That the mechanical aptitude tests devised to distinguish the ability to manipulate objects from the ability to manipulate words, numbers, and other clerical items is a better indicator of success at clerical than success at mechanical work.

"That on the whole, school records and examinations at the age of 14 would not enable the counselor to estimate his fitness to succeed in this, that, and the other sort of work.

"That better predictions may be made from groups older than used in this study."

In the study on *Minnesota Mechanical Ability Tests*,[2] the findings are summarized as follows:

"That substitution of group paper and pencil tests for individual test failed of realization.

"No close correspondence was found between mechanical ability and environmental conditions.

"A study of group differences in the distributions of mechanical ability shows it increases with age from eleven to twenty; it increases as academic grades are reached, although correspondence with academic status is not as close as with age."

Link[3] found certain specially constructed test machines and devices to be of value in selecting workers for a specific task. For apprentice toolmakers and machinists, he found the Stenquist mechanical assembling test, the cube test, and a form board test

[1] Thorndike, E. L., *Prediction of Vocational Success*, Teachers College, Columbia University, 1934.

[2] *Minnesota Mechanical Ability Tests*, University of Minnesota Press.

[3] Link, H. C., *Employment Psychology*, New York, The Macmillan Company, 1919.

correlated highly with shop foreman's ranking.

Ross[4] found elementary-school records of value in predicting high-school success. Symonds[5] states that school marks are more predictive than any other single measure for predicting success in a field that involves similar work. Somers[6] found former school records were significant for predicting teaching success.

After careful consideration of the many factors involved in attempting to select pupils, and the administrative difficulties in trying to administer tests and to obtain inventories for measuring aptitudes and personality traits and likewise the limitations of their predictive value, the decision was made to limit this study to school records.

The decision was further strengthened by the favorable findings of the studies previously cited on the predictive value of school records.

Then, too, from the point of view of its immediate practicality, a simple, direct, and inexpensive device would have to be found if it is to be of use. School records are such that they could be made available at the time the boy is applying for admission.

The question then arises: To what extent can these records be used for predicting success in the vocational high school? Previous school records have been found to be of value in predicting high-school[7] success, normal-school[8] success, and college[9] success. Do they have the same value in predicting vocational-high-school success?

The problem then is to find what answer or answers can be made to the question: "What is the relation between previous school records and vocational-high-school success?"

Nature and Source of Data

The data studied consist of the school records of boys enrolled at the Clifford B. Connelley Vocational High School, Pittsburgh, Pa., during the period of 1930 to 1935. These records, consisting of over 3,000 cases were examined and all cases of boys in school for less than one semester were removed. Those in attendance less than one semester were eliminated since they had not been in a shop long enough to enable the instructor to form an estimate of their true ability. The boys range in age from 14 to 21, and in grades from 9B to graduates of the 12A grade. About 2 per cent were Negroes. Various races and creeds were represented.

The school records were of three kinds:

1. Former school records.
2. Vocational-high-school records.
3. Employment records.

Relationships of School Records

Thorndike[10] in his study of prediction of vocational success makes the statement, that better predictions may be made from groups older than used in this study. (His study included 2,225 children 13 years of age and older.)

The study of *Minnesota Mechanical Ability Tests*[11] finds: A study of group differences in the distribution of mechanical ability shows it increases with age from eleven to twenty; it increases as academic grades are reached although correspondence

TABLE I

THE RELATION OF ENTERING AGE FOR EACH TRADE TO TERM OF STAY IN THE TRADE SCHOOL

Shops		*Entering Age* 14	15	16	17	18	19	20	21
Auto	N	34	90	37	22	7	5	4	
	A	3.35	2.93	2.97	3.04	1.42	1.40	1.00	.....
Bricklaying	N	16	30	6	4		2		
	A	2.06	2.46	3.33	1.25	.....	1.00	.....	.....
Cabinet	N	48	62	33	12	4	1	1	
	A	2.66	2.62	1.93	1.66	2.00	1.00	1.00	.....
Carpentry	N	19	23	12	4		1		
	A	2.63	1.70	1.66	1.00	.....	1.00	.....	.....
Commercial Art	N	15	13	13	9	5	1	2	
	A	4.20	3.00	3.69	2.66	3.00	1.00	1.00	.....
Elect. Wiring	N	45	58	38	13	2	5	2	
	A	2.46	2.58	2.00	1.77	1.00	3.00	3.00	.....
Elect. Power	N	16	36	21	17	15	2	2	1
	A	4.43	4.41	2.33	2.94	2.79	3.00	4.50	2.00
Foundry	N	21	24	15	7	3			
	A	2.90	2.16	2.00	2.00	1.00	.....	.....	.....
Machine	N	22	36	11	10	4	2	2	
	A	3.90	2.30	2.72	2.40	1.25	2.50	2.00	.....
Pattern	N	15	14	10	1	1	2	1	1
	A	3.73	2.35	3.00	1.00	1.00	2.50	2.00	1.00
Printing	N	35	41	25	13	5	3	1	
	A	3.77	2.41	3.60	3.15	1.40	3.00	3.00	.....
Plumbing	N	13	20	7	3	6			
	A	2.76	3.75	2.42	2.33	3.00			
Radio	N	11	18	22	2	3	2	2	1
	A	2.36	2.50	2.77	3.00	1.66	3.50	2.00	1.00
Sheet Metal	N	30	32	19	11	2			
	A	2.73	1.90	1.84	2.27	2.00	.....	.....	.....
Telephone	N	4	12	8	4	4	1	2	
	A	3.00	1.83	2.37	3.25	1.50	1.0	02.00	.....
Trade Draft	N	17	28	16	12	6	2	2	
	A	3.88	3.28	2.25	2.41	2.66	3.50	4.50	.....
Welding	N	16	4	15	9	12	7	2	
	A	6.12	6.50	3.80	3.77	2.58	3.71	5.00	.....
Totals	N	377	541	308	153	79	36	23	3
	A	3.29	2.73	2.57	2.52	2.19	2.58	2.52	1.33

N—Number of Boys A—Average Semesters in Attendance

TABLE II

THE RELATION OF ENTERING AGE FOR TRADE GROUPS TO TERM OF STAY IN THE TRADE SCHOOL

Trade Groups		*Entering Age* 14	15	16	17	18	19	20	21
Bldg.	N	78	105	44	22	8	3		
	A	2.78	2.37	2.09	1.86	2.75	1 00	.....	.....
Elect.	N	76	124	89	36	24	10	8	2
	A	2.89	3.00	2.30	2.55	2.29	2.90	2.87	1.50
Metal	N	93	154	78	48	26	14	8	
	A	3.86	2.76	2.91	2.89	1.88	2.71	2.25	.....
Woodwork	N	82	99	55	17	5	4	2	1
	A	2.85	2.35	2.07	1.49	1.80	1.75	1.66	1.00
Graphic Arts	N	67	82	54	34	16	6	5	
	A	3.89	2.87	3.22	2.76	2.37	2.83	2.80	.....

N—Number of Boys A—Average Number of Semesters

A third approach to this question was made through grouping the entering age levels into two-year intervals in place of one year and

[4]Ross, Campbell, *The Relationship between Grade School and High School Records.* Teachers College, Columbia University, 1925.

[5]Symonds, P. M., *Measurements in Secondary Education*, New York, The Macmillan Company, 1927.

[6]Somers, Grover T., *Pedagogical Prognosis Predicting the Success of Prospective Teachers*, Teachers College, Columbia University, 1923.

[7]Ross, Campbell, *op. cit.*

[8]Somers, Grover T., *ibid.*

[9]Held, Omar C., *An Attempt to Predict the Success of University Freshmen in Their Adjustment to Scholastic Work*, Ph.D. Thesis, University of Pittsburgh, 1933.

[10]Thorndike, E. L., *op. cit.*

[11]*Minnesota Mechanical Ability Tests, op. cit.*

with academic status is not as close as with age.

The age at which a boy should enter the trade school is a question that deserves consideration. The Smith-Hughes Act[12] limits the minimum entering age to 14 years; Snedden[13] claims the learning of a trade is a highly specialized form of education and should be preceded by a well-rounded course in general education. This would permit specialization to take place at about 18 years of age.

The passage of the Child Labor Law in Pennsylvania,[14] limiting employment to 16, and in certain kinds of occupations to 18 years of age, has encouraged many of the educators to increase the age requirements for entrance to trade and vocational schools. These entrance requirements throughout Pennsylvania vary, and are largely determined by the facilities available for trade training within the school. Where the facilities are limited, the older boys are given preference.

The findings of the two studies cited, as well as the minimum entering age set by the Smith-Hughes Act,[15] the age requirements set by the Child Labor Law in Pennsylvania,[16] and the differences of opinion among experts in the field of vocational education on the best entering age, imply that age is a factor that needs to be given attention when setting up criteria for the selection of trade-school boys.

The Minnesota[17] study suggests the importance of considering grade in the prediction of vocational-high-school success and the Thorndike[18] study includes intelligence-test scores in addition to the age-grade status.

It is the purpose of this article to determine the relationships of these factors of entering age, grade, and intelligence with success in the vocational high school. The material is divided into two parts: (*a*) Relation of Entering Age, Grade, and Intelligence to Persistence in Attendance at the Clifford B. Connelley Vocational High School. (*b*) Relation of Entering Age, Grade, and Intelligence to Achievement at the Clifford B. Connelley Vocational High School.

Relation of Entering Age, Grade, and Intelligence to Persistence in Attendance

The questions to be considered in this part of the study are:

1. Is there a relation between the age at which a boy enters the vocational high school and the length of time he remains in school?
2. Is there a relation between the grade at which a boy enters the vocational high school and the length of time he remains in school?
3. Is there a relation between a boys' intelligence and the length of time he remains in the vocational high school?

[12] Smith-Hughes Act, *op. cit.*
[13] Snedden, D., *What's Wrong with American Education*, J. B. Lippincott Company, 1927.
[14] Child Labor Law, Pennsylvania, 1935.
[15] Smith-Hughes Act, *op. cit.*
[16] Child Labor Law, *op. cit.*
[17] *Minnesota Mechanical Ability Tests, op. cit.*
[18] Thorndike, E. L., *op. cit.*

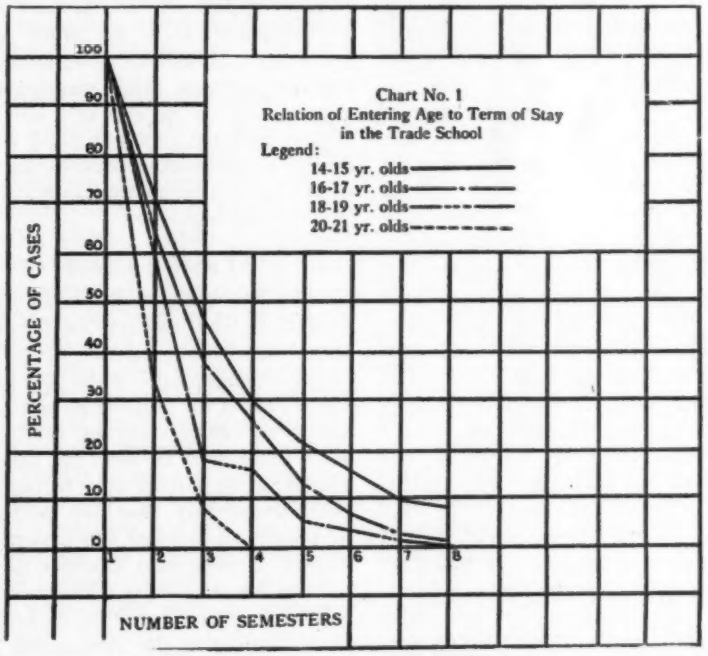
Table III

Percentage of Boys in Each Age Group in the Trade School at End of Each Semester

This table is a cumulative record of the number and percentage of boys in each age group and the number of semesters they stayed in the trade school. The percentages start at 100 at the end of the first semester. The figures shown are at the end of the semester.

	Entering Age									
	14-15		*16-17*		*18-19*		*20-21*		*Total*	
Semester	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
1	918	100.0	461	100.0	115	100.0	26	100.0	1520	100.0
2	627	68.3	291	63.1	66	57.4	9	34.6	993	65.3
3	415	45.2	173	37.5	32	19.1	2	7.6	622	40.9
4	277	30.1	117	25.3	19	16.5	....	.....	413	27.1
5	191	20.8	61	13.2	7	6.1	....	.....	259	17.0
6	144	15.6	33	7.1	4	3.4	....	.....	181	11.9
7	90	9.8	13	2.8	2	1.7	....	.....	105	6.9
8	60	6.5	7	1.5	1	.....	....	.....	68	4.4

The data in Table 3 are shown in graph form in Chart 1.



The Relation of Entering Age to Persistence in Attendance

The data used were the entering age and the number of semesters in Clifford B. Connelley Vocational High School for 1,520 boys. No boy was included who had not been attending the school for at least one full semester, or who had been transferred to this school from another trade school.

Table I shows the relation between the entering age and the term of stay in the trade school for each trade.

The entering ages are shown in one-year step intervals and the term of stay in semesters. A semester is 100 six-hour school days. The data are for each of the seventeen trades, and show a wide range in the average term of stay in school for various shops and for various entering ages. These averages have a range of 1.00 to 6.50 semesters. The number of cases drop off rapidly as the entering age increases.

The averages at bottom of table for all trades show that boys entering between fourteen and fifteen years of age stay longest in the school.

Another approach to the question of entering age was made through the grouping of those trades that have interests, knowledge, and skills somewhat in common, such as the building-trades group, combining the plumbing, sheet metal, and bricklaying; the electrical-trades group, combining the electric wiring, electric power and equipment, radio and telephone; the graphic-arts trade group combining the commercial art, printing, and trade drafting; the metal-trade group combining the auto mechanics, foundry, machine, and welding;

and the woodworking-trade group, combining the cabinet, carpentry, and pattern-making. This grouping gives larger numbers in the upper age levels.

Table II shows grouping of trades. According to these findings, the 14-year-old group stays longest in the trade school, with the exception of the electrical group. This group shows a slight increase in length of stay for the 15-year-olds.

A third approach to this question was made through grouping the entering-age levels into two-year intervals in place of one-year and computing the percentages of cases staying in school for varying periods of time for each age group.

The entering-age groups were combined into four groups — those entering between 14 and 15.99 years of age are the 14–15-year-old group, those between 16 and 17.99 are the 16–17-year-old group, those between 18 and 19.99 years are the 18–19-year-old group, and those between 20 and 21-year-old group. Table III shows this grouping in terms of percentage of boys.

The curves show the percentage of boys in each age group in school at given periods of time. For example: 68 per cent of the 14–15-year-old group stayed in school two semesters; 45 per cent three semesters; 30 per cent, four semesters; 21 per cent, five semesters; approximately 16 per cent, six semesters; 10 per cent, seven semesters, and approximately 7 per cent, eight semesters or over.

(To be continued)

In Again—Out Again

Hyman Goldstein

Psychologist,
New York State Vocational Institution,
West Coxsackie, New York

The right choice of occupation and job satisfaction have such a definite influence on future happiness and success that vocational guidance deserves to get ever-increasing attention of all instructors engaged in industrial arts and vocational education.

It has been estimated that under normal business conditions one and a half million young people leave our educational institutions each year in order to enter wage-earning occupations. That is quite an imposing number. Yet from other sources we reach the conservative estimate that twenty to twenty-five million workers change jobs to enter others every year. Of course, this labor turnover represents a tremendous waste in terms of time, money, and human energies. If we consider that the cost of hiring and training an employee expressed in the cost of supervision, spoilage of materials, and the like, is fifty dollars, on the average, then we arrive at the staggering sum of one billion dollars yearly that is spent because the worker may feel that there is "no chance for advancement" or that the "work is too monotonous" or "too heavy," or that "there is no interest in the work" or "not enough money in the job," or that "the boss is too cranky" or the like.

Let us get a clearer picture by looking at a specific example. Questionnaires submitted to 1,700 employed people taken at random revealed the high incidence of job instability among our workers. It was found that 64 per cent of these individuals had changed their occupations from one to three or more times. Of these job vagabonds, 83 per cent had changed from one to another that was entirely unrelated to it and of these 83 per cent, one third, discouraged and tired of their work, still desired to change into other *unrelated* occupations. It seems then that even those who have had several trials in varied occupations and who appear to have chosen one final occupation and to have settled comfortably in it for many years still desire anxiously to change to a new occupation that may demand skills that the worker does not possess. A carpenter may desire to change because he doesn't find his work interesting; a cashier is unhappy because he does not like to meet people; a telegrapher finds his work terribly monotonous; long hours of work may make a grocer unhappy, while mending clothes may be hard on the eyes of a tailor. It is evident that the peace of mind and efficiency of the worker rests on something more than just bread and meat and a bed in which to sleep.

Labor Turnover

Some interesting results await us when we analyze labor turnover for the different ages. It has been found that job separation among young people under 20 years of age is out of all proportion to any other age group. In a study of 245,000 New York State boys between the ages of 16 and 18, in 1921 more than 50 per cent of them stated that they had held on the average three or more jobs a year. About 25,000 of these boys changed their jobs on the average of every three months. This habit of shifting from job to job, which has its origin in this first period of employment, is in large degree responsible for the staggering labor turnover of our adult population. Changing occupations is getting to require about as much deliberation as changing neckties. It has become a rather popular American game.

It is not a far cry from the chronic job shifter to the chronic job shirker — the hobo. Just as that irresponsible but good-natured American variety of the genus hobo is seeking an elusive paradise where work is unknown, in similar fashion does the vocational gypsy seek relief from the binding ties of a job routine. He seeks variety in any form, shape, or color. A study entitled "Wandering Minds and Wandering Feet"[1] gives the results of a study made in 1935 of 230 transient boys between the ages of 13 and 25. There was great discrepancy between the jobs they had held and the ambitions they had. Almost one half of them stated they had not yet fitted into their desired niche.

The question naturally arises whether or not the criminal is in some measure a product of labor turnover. We have a large standing army of occupational misfits who are bandied about from store to store, from industry to industry, and from community to community. They figuratively knock about from pillar to post, frequently being helped along in their meanderings by little pink slips. A great deal of the time they are out of work and must, of necessity, seek support from families, friends, or charitable agencies. When they won't beg, they steal. The very nature of their inability to hold a job and find contentment and emotional outlets in it predisposes them to delinquent behavior through the avenues of dependency or psychiatric maladjustment. An investigation in 1935 of 1,500 delinquent boys between the ages of 16 and 26 revealed evidences of vocational

[1] A. Allardyce, "Wandering Minds and Wandering Feet," Occupations, 1934, 13, 153–155, New York City.

maladjustment among these offenders. Over a period of four years they had held, on the average, three different jobs. Their employment had tended to be intermittent and their pay low. The frequent change of jobs which characterized their vocational history was ascribed in the majority of cases to forces beyond their control. This picture is rather typical of the average delinquent who "is a disorganized, relatively unstable person. His previous life has been of a sort to discourage any fixed habits of a desirable sort. If he has worked at all, he has usually been employed in some of the street trades. These do not develop desirable work habits and they render the problem of adjustment more difficult. The excitement and irresponsibility of life on the streets makes the regular life of other occupations seem monotonous and unattractive. Life has been aimless, drifting, and undirected. No vocational interests have been established."[3] Many of these same factors operate to explain the criminality of a large proportion of our adult prison population.

Job Dissatisfaction

There is nothing more destructive of human happiness than dissatisfaction that arises from a distasteful occupation. It is a condition that causes ill health, neurasthenia, and all sorts of psychic disturbances. "The maladjusted worker must often fail to achieve material prosperity; and such failure, in addition to aggravating his mental discontent, may affect his physical well-being and that of his dependents, who, indeed, may suffer in more ways than one."[3] Frequently marital unhappiness and divorce are the unfortunate consequences of the breadwinner's inability to hold a job and pursue a desirable occupation. One can easily see about him thousands of workers discouraged, irritable, morose, and unhappy. Although their vocational maladjustments vary in kind and in degree, although some of these maladjustments are comparatively innocuous, their dissatisfaction in many cases knows no bounds. Their job maladjustment often finds expression in radical sentiments. They blame society for their unhappy state of affairs. Society must take the blame. The home, the church, and the school failed in their duty of orienting these people to the pursuit of satisfying careers. Failure was thus criminally encouraged.

The employment of men and women in unsuitable tasks is one of the greatest sources of friction and wastage in industry and commerce today. The bill of one billion dollars yearly for labor turnover is primarily a bill for occupational maladjustment. Who foots this bill? It is not the employer who pays, but rather society. The employer, by the very nature of his position in the scheme of things, is a middleman between the producers, his employees, and the consumers, the public. What he loses on the one hand by the cost of turnover he makes up on the other by increased prices. Society pays dearly for its neglect. Furthermore, delinquency, dependency, and mental disease, the stepchildren of job instability, are the joint burden and responsibility of society in general, and the community in particular. However, in terms of human misery and not merely in terms of the insensible dollar, the employee is by far the heaviest loser. Not only does continual shifting produce slovenly habits but it militates against reaching positions of importance because by the time they are ready for promotion, if ever they are industrious enough to merit it, they are more than ready for a change of job.

Vocational Maladjustment

Much attention has been given to the problem of vocational maladjustment by employment managers, personnel directors and superintendents, and by efficiency and industrial engineers. A major conclusion reached has been that altogether too much emphasis, particularly since the advent of the depression, has been put on securing a job — any job.

Unfortunately, altogether too few of us have any inkling of the kind of work that we were cut out for in the beginning. This lack of wholesome vocational information is one of the main causes of job misplacement. Where there is no urge for any particular occupation, the majority of us merely drift into the first convenient opening that is presented. Children, young people, and even adults enter occupational life mentally blind and with but the vaguest ideas about it. The average modern youth "has no clear knowledge of what kinds of work exist, nor of the training needed for each, nor how people find their way into each kind of work, nor of his own personal fitness for any given occupation."[4] Usually in order to be sure that he get a job, any job, he clutches at the first job that presents itself regardless of its fitness and desirability. With just a general knowledge, and little if any specific training, he may be able to get by in times of prosperity. However, in periods of economic turmoil, when the supply of labor greatly exceeds the demand for it, only those usually survive who are able with efficiency to contribute something worth while to their jobs.

Of course, it is recognized that "youth is a period of instability, adventure, unformed goals, and inadequately integrated personality trends. The time of life when the pot of gold at the end of the rainbow is a reality, when other fields are always greener than those near at hand, when some other job or job environment has more to offer than the one now engaged in that seems so dull and uninteresting, when continuity of effort, planfulness, and purposeful use of energy have not only not become habitual, but are not appreciated."[5] But, unfortunately, while we realize this, we must also be aware that a genuine career must in the great majority of cases be founded in the years of youth.

It is also recognized that job conditions and job inducements, or lack of them, may influence a worker to or away from certain positions. But above and beyond all this, the lack of intelligence shown by the average job seeker in selecting his lifework is amazing. We must agree that "his lack of skill surpasses his other shortcomings. He has never yet learned how to use more than one-seventh of all the potential with which he is born. Yet not out of any inner necessity! For it grows plainer every year that most waste of energy arises from pure ignorance and faulty training."[6]

Not always is the individual solely to blame for failure to know himself and his would-be career. Quite often other factors make guidance impossible. It is evident that many delinquents, for instance, have led disorganized lives and this very fact would, of necessity, have precluded proper conditions for satisfactory guidance and adjustment during their period of antisocial behavior.

Aiming too Low or too High

What are some of the conditions that make for job misplacement? We know that such practices as the placement of workers in work for which they are too intelligent or too dull, the placement of workers in highly repetitive work for which they may be emotionally or temperamentally unfitted, speeding up workers beyond their natural capacity, the placement of workers where too much or too little physical energy is required, and so forth, are not conducive to adjustment and efficiency.

Some jobs make more demand upon the intellect than others. They call for keen mental gymnastics. Others demand nothing

[3] H. D. Williams, E. L. Angell, and R. R. Hannum, "Meeting the Occupational Needs of Problem Children," Occupations, 1934, 13, 146–152, New York City.

[3] A. Macrae, *Talents and Temperaments*, D. Appleton-Century Co., New York City.

[4] L. S. Hollingworth, *The Psychology of the Adolescent*, D. Appleton-Century Co., New York City.

[5] V. V. Anderson, *Psychiatry in Industry*, Harper and Bros., New York City.

[6] W. B. Pitkin, *More Power to You!*, Simon and Schuster, Inc., New York City.

more than a routine pulling of a lever or watching with stolid unconcern a whirring machine.

There is an ever-growing army of individuals whose aims and aspirations outstrip their real abilities. Figuratively, they want to bite off a bigger job than they can chew. We are familiar with the laborer or the grocery clerk or the elevator operator who feels that he will achieve true happiness only when he can argue a case at the bar or perform a delicate surgical operation or perfect a new process for the transmission of television by radio. These individuals are destined by their limited abilities to continue at menial labor. Cruel as it may seem, this destination is a blessed one for they would certainly be much more discontented and inefficient at professional levels with their limited intelligence than they could possibly be at their present level. A study made in 1933 of 620 adults indicated "that the less the mental level of an adult, the more likely he is to aspire to positions in which he could not possibly succeed."[7]

The occupations at the higher end of the scale are by nature more intellectually exacting and more severely restrictive than those at the lower end. Naturally if a person of limited capacity is set at work that is too complicated and difficult for him, he is very inefficient. He struggles vainly to accomplish what is beyond his power. Fortunately for him he soon drops out of the competitive picture. It must be said, however, that even persons diagnosed as feeble-minded are very often good workers and may make satisfactory vocational adjustments if they are placed in a type of work especially suited to their peculiar limitations.

Another army of the maladjusted fail to find in their jobs sufficient challenges to their high intellectual levels. Although they have no difficulty in earning a living at what is too easy for them, they are extremely unhappy. Their work becomes boring and irksome and they soon feel that they are doomed to spend their days at routine tasks. The deadly treadmill of routine is too confining for these individuals with initiative and originality. This industrial age of ours has rightly been called the golden age of the moron. With a mechanized division of labor, we have inherited both the machine that is specialized to cap a bottle and the demand for workers that do not think. There are many jobs today that require only a child's intelligence. In a recent study, a personnel executive of a large company that employs several thousand office workers investigated the causes for employees leaving the company. In a significant number of cases it was found that the employees of high intelligence had usually found insufficient outlet in the work for their superior intelligence. Cases of this sort are more pathetic than those of the individual with limited capacity struggling with painful consciousness of his own inferiority to make the grade which he is forever unable to attain. The leveling forces of economic pressure will usually help the latter find his satisfactory low level. There are many factors, however, which may keep the former from reaching a satisfactory adjustment at a superior level.

Too many college graduates fail in their jobs because they either lack interest in what they are doing, or they find, after a year or so out of college, that they are better fitted for work other than that for which they have trained. Whereas college instructors may take special pains to make their courses attractive and interesting, the average run-of-the-mill employer cares little and tries still less to catch the fancy or liking of his new college-bred employee.

Emotional Instability

"Much of the vocational maladjustment in American industry is the result neither of intellectual deficiency nor technical incompetency, nor of objectionable factors inherent in the work itself, but rather of non-adjustive emotional tendencies within the individual which make a reasonable degree of harmony between him and most types of work impossible."[8] In 9 cases out of 10, the person who is more or less constantly in a state of excessive emotional tension, who is high strung and easily upset, who is, in short, a "bundle of nerves" will be found to be vocationally misplaced. The converse is usually true also. A study made in 1936 of 500 teachers in 51 urban and rural communities indicated a marked relationship between emotional adjustment and job satisfaction.

Generally, because of some emotional maladjustment which may be due to deep-seated personality defects or to the strain of continual financial pressure or to other causes, and which may take the form of unhealthy mental preoccupations and attitudes toward reality, faulty ways of meeting important life situations, anxiety states, inferiority feelings, obsessions, irrational fears and hatreds, and so forth, the worker is irritable and dissatisfied. Since his work fails to give him the satisfaction that he seeks, the natural and logical thing to blame is his work. The inability to find satisfaction in one's working life is just another reflection of the inability to achieve happiness in one's personal life.

The complaints of these dissatisfied workers may state that "they are not treated fairly in their work, that they are not paid nearly what they are worth, that younger employees are advanced much more rapidly than they, that their work doesn't nearly measure up to what they are capable of doing,"[9] that the opportunities offered by the work are distinctly limited, that the work is too monotonous, and so forth. It seems that where emotion steps in, reason flies out the window.

Even if these workers are vocationally stable under normal working conditions, they may be distinctly unstable when confronted with disturbing conditions which are not customary or common to the working situation. These conditions may take the form of new responsibilities, new supervisors, or a new work location. Many more dismissals are based on personality than we imagine. The employees of a large company were upon their discharge given careful psychiatric examination. A study of 3,000 such dismissals revealed that 62.4 per cent of them had been dismissed because of personality maladjustment rather than because of lack of skill or training!

Personality maladjustment, like vocational maladjustment, is not an absolute quantity and it may vary in degree from individual to individual. All of us are to some extent the victims of ourselves and of our job situations. Some of us are more so than others. These two great causes of unhappiness and discontent, operating conjointly and usually subtly interwoven, may seek emotional expression in the excesses of crime, alcoholism, drug addiction, prostitution, and inability to hold a job.

The chronic job changer bears all the common and obvious symptoms of general emotional maladjustment. He usually holds several jobs in the course of a year's time giving as reasons for changing from one to another such complaints as "too monotonous," "no advancement," "quarrel with the boss," and the like. However, when they leave one job they are fairly certain to go through the same experience on the next job. When they leave that one, usually after a few weeks or months, they give the identical excuses. Not only do they give the same reasons for leaving one job as they do for another, but apparently they have in many cases given these self-same reasons for leaving school. A recent investigation was made to study the relation of maladjustment in school to maladjustment in the earlier years of industrial experience. There was found a marked correlation between maladjustments in

[7] A. G. Grace, *Psychological Abstracts*, 1933, No. 2543.

[8] V. E. Fisher and J. V. Hanna, *The Dissatisfied Worker*, Macmillan Co., New York City.

[9] V. E. Fisher and J. V. Hanna, *loc. cit.*

school and those in industry. When an individual left school prematurely, he usually gave as reasons for leaving explanations that indicated the same general causes for dissatisfaction as other young workers gave for leaving jobs. It is evident that emotional maladjustments are carried over from the home and the school to industry. Defective personality traits are as crippling in industry as they are in school.

Why Jobs are Chosen

We have discussed some of the reasons why individuals become dissatisfied and leave their occupations. Let us now see why individuals enter certain occupations. What are the motivating forces that lead a person, be he child, youth, or adult, to choose a certain vocation in preference to all others?

It appears from a casual observation that the great majority of our occupational misfits have chosen the wrong vocation and are unable therefore to make the proper adjustments with the particular make-ups and capacities that they have. That is the main cause of their trouble. A further observation reveals the fact that their choice is wrong in many cases because it was too often based on chance, individual fancy, or superficial lure and not on the surer guarantees of self-knowledge. The odds were weighted heavily against success from the very start.

Custom, heredity, propinquity, or sheer accident are much oftener responsible for vocational choices than deliberate or conscientious design. A study of the reasons for vocational choice given by 1,700 employed individuals from commercial and professional ranks revealed some interesting results. Forty-nine per cent of them were in their present jobs because of external influences, such as need of money, opportunity presenting itself, forced by circumstances, influences of parents or others, and so forth. To think that practically half of this group had entered their occupations without any material consideration of their own aptitudes, abilities, or even interests. A study of the job histories of this group brought to light an expected and understandable job instability. It is apparent that it is the rare individual who doesn't take lightly the choice of a lifework which is one of the most important decisions of life.

In this heyday of individualism and self-expression, the wish of a youngster for a certain vocation, in the absence of obvious physical or mental defects, is usually enough to cast the deciding influence one way or another. He wants to be a carpenter — so a carpenter he'll be. Yet for any significant part that intelligence played in the choice, he might have become a peddler of vegetables or a maker of saddles. The child, as a rule, cannot give a logical reason for his choice except that he "likes it." When he does give some more rational motive it appears to be one that is explained by his choice rather than explanatory in itself. How often it happens that the occupation is chosen which appears, of all occupations, to be the one in which failure for the particular child is most imminent and probable.

These eeny-meeny-miney-mo choices, oftentimes directed by some emotional eccentricities of the youngster, are definitely not "due to the operation of some mysterious inner mechanism which infallibly directs the child to his proper sphere in life. . . ."[10] He may like some one aspect of the occupation, such as stability of employment or rate of remuneration, consequently, he knows that he *must* like the occupation itself. It is apparent, then, that not all individuals are forced into occupations distasteful to them by a malevolent fate or by domineering fathers. Quite often they voluntarily rush in where angels fear to tread. They choose their lifework without the slightest conception of what it is like or what they are like.

Son Succeeding Father

Man is trying to go nature one better. In addition to the inheritance of physical and mental characteristics, he would like to have his own ambitions appear in the vocational choices of his offspring. To follow in a father's footsteps is more often a command rather than a desire. Sometimes for sentimental reasons it is wished that the son would succeed to the successful lumber business; at other times, the son should make a successful physician because his father's medical practice is a very flourishing one. Not a few of these wishes are illogical and doomed to failure because the youngster is being fitted into an occupation above or below his general capacity. "The most painful maladjustments due to parental attitude are probably those in which an able father tries to force a relatively incompetent son to follow the paternal vocation. . . . The boy is expected to maintain the family level, in business or in the professions; yet by a combination of ancestral traits he varies from the level of his father and is fitted by mentality for the calling of bricklayer, plumber, or teamster."[11]

Just as some youngsters are pushed into particular vocations by aspiring parents, in like manner other youngsters are kept out of certain vocations by parental influence. A discouraged and unsuccessful shoemaker cannot let his boy enter that trade to repeat his own errors no matter if the boy shows aptitude for that particular trade. Since the attractions of clerical work loom large in the eyes of the disgruntled shoemaker, another occupational misfit is launched on a clerical career. Only after many failures and heartaches will he be allowed finally to secure work in a shoe shop. Of course, in some cases there may be an earnest desire by the parent to have his son work at something higher and better than his own occupation. This is a commendable motive but presupposes that the son has the capacity for working at a higher level. A study of the vocational choices of 4,543 high-school boys in 1935 showed that only 1 per cent chose laboring occupations which were represented by 11 per cent of the fathers and by 30 per cent of the population as shown by census figures.

There are many other reasons for human blundering than the ones given above. Emulation of friends who may be linoleum layers or steeplejacks; imitation of heroes who may be aviators, prize fighters, or flagpole sitters; the desire to work beside a certain pal no matter what he does nor where he does it; the advertisements in the daily papers that call for inexperienced butcher's helpers or office boys; the proximity of the pretzel factory on the next block (and they always take on general helpers); comparative success in high-school English which signifies in the youngster's mind the probability of a reporter's job in the near future, or success in algebra which is in his imagination a prelude to a future C.P.A. career; all these are some of the more or less irrelevant considerations that cause our youngsters and adults to drift aimlessly and irrationally into the wrong occupations. They play their part in destroying human happiness.

Planning one's life has become both fashionable and practicable. Because a plan of life is a plan of work some organized efforts have been made to help both the young and the old in selecting a proper lifework. But not all that have been attracted to this career of service have been either capable or ethical. It appears that "like all other domains of twilight, this field is the happy hunting ground of quacks, cultists, religious fakirs, or sincere but blundering amateurs. To drive out all of these is quite impossible today, for nobody posseses adequate ammunition in the form of easily demonstrable facts."[12]

The great mass of people are eager and willing to believe. Unfortunately, they are very rarely discriminating enough in their beliefs to be able to separate the wheat

[10] A. Macrae, *op. cit.*
[11] L. S. Hollingworth, *op. cit.*
[12] W. B. Pitkin, *op. cit.*

from the chaff in all the material that is hurled at them from radio, screen, books, magazines, newspapers, and the literature of countless schools of popular psychology, inspirational cults, and vocational yogis of all kinds.

The rise of these varied types of fortune telling has been in the majority of cases based on the belief that each individual is at birth endowed with certain capacities and traits that spell one particular trade. But, of course, the individual is unable to decide what this particular trade is. The searching scrutiny of the tea-leaf reader, the astrologer, the palmist, the numerologist, the physiognomist, or the phrenologist is necessary to foretell whether one should be a piano tuner or a window trimmer. The bumps on your head, the lines in your palm, the number of letters in your name, the astrological bodies that chart your destinies, your physiognomical high and low regions, these and others like them have been the straws at which thousands of disillusioned workers have grasped. "While it is undoubtedly true that there are many sharp observations and real facts hidden in such pseudo-systems, it is also indubitably true that they are all more in terms of superficial resemblances or occasional correlations than in terms of scientific observation and exact knowledge. Assertions and beliefs that a big chin denotes will-power and a sharp nose inquisitiveness, a square head health, and large ears lack of culture, large hands and feet poor breeding, and blue veins delicate heritage, fail to take account of the additional fact that such traits are largely a matter of crude structure, are little or not modified by experience and, finally, have perhaps as many exceptions as hits."[13]

[13] D. B. Leary, *Modern Psychology: Normal and Abnormal*, J. B. Lippincott Co., Philadelphia, Pa.

Specific Suggestions for Teaching Industrial Students

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Fourteen points which will assist the instructor of industrial arts and vocational education to make his work more vital and effective.

It is generally accepted by industrial teachers that pupils in industrial courses differ from their academic brothers in kind rather than degree. That is, they tend to differ in the kinds of abilities possessed rather than in the quality of those abilities. The vocational-industrial pupil is usually equal in intelligence to the academic or general pupil, but for various reasons the full power of that intelligence is frequently not used in studying subjects academic in nature.

Yet all these boys are able to achieve important and difficult goals in general education. Whether they succeed in doing so, however, depends largely on the care and the skill with which teaching techniques and materials are adapted to their particular needs and aptitudes.

In this article are presented some techniques which have proved helpful and effective in teaching vocational-industrial pupils in both heterogeneous and homogeneous groups in general and related subjects. These suggestions apply with equal force to the teaching of trade theory in class groups. These techniques will be presented as a series of specific suggestions or principles, with such brief explanation as is necessary to make clear their application.

Although the statement of many of these principles is rather dogmatic, the author is fully aware that many of them are controversial issues in the minds of many teachers.

1. Each pupil should have for his personal use a copy of the text material being used. Some school districts provide only a shelf of reference books in industrial courses; others provide the pupil with a book only during the class period; still many others resort to an extensive duplication of text material by the mimeograph or other method. Each of these methods has both its good and its bad points, but for best results, each pupil should have an individual copy of the text for his use whenever he needs to use it. Further, printed text material is usually much easier to read than is duplicated material. Since many pupils are retarded in various phases of reading, the author believes that printed text material is much to be preferred.

2. Before starting any learning activity, state clearly what the goal of that unit is, what the important points are, and what the method of procedure will be. Many industrial students have an antagonistic attitude toward the general and the related subjects. They may not have been successful in them in the past, or, for other reasons, they believe these subjects useless. If these pupils understand and accept the goal as worth while, half the battle is won. It is important, therefore, that this group understand the objective so that they begin the learning unit with the proper attitude toward it.

In this connection, it is important to remember that these boys think in terms of concrete life experiences. Consequently, they attach more importance to the practical aspects of their education than many other groups of pupils.

3. In introducing a learning unit, start with that which is familiar.

The materials used in introducing a new learning unit should be so familiar and so simple as to be perfectly obvious to the less gifted students. Such a beginning permits the dull-normal pupil to feel that he will be able to accomplish something and gives him some self-confidence and encouragement in working on the problems ahead. It also gives the better pupil a better foundation on which to build.

4. Plan each lesson carefully. False starts by the teacher are discouraging and confusing; too many details presented early in the unit are confusing. These false moves caused by poorly planned procedure, tend to cause the pupils to relax their efforts. The progress made in presenting the unit should be as uninterrupted as possible.

5. Use simple devices to show these pupils what progress they have actually made. Demonstrate visually by means of simple measures that the group and the individuals have actually learned something or that they have made some definite progress. Some methods that might be used are:

a) A pretest and an end test.

b) Use simple charts to indicate greater achievement.

c) Use the newly acquired knowledge to solve some practical problem before the group as a whole.

d) Keep a cumulative record of each

boy's work, or better yet file his work in an individual folder or cabinet.

6. Class activities should be changed frequently. The attention span of many of these boys in some fields is rather short. This is especially true of those subjects in which achievement has been poor. At intervals during the class or theory period, provide changes in the type of activity. For example, shift from pupil discussion to teacher demonstration, from work at the seat to work at the board, from teacher activity to pupil activity, or from one phase of the subject to another.

7. Use visual aids and materials as much as possible. Pictures, demonstrations, colored chalk to emphasize the contrast or the importance of certain items, charts, diagrams, or models are all teaching aids helpful to the pupil. It is important, however, that the teacher make sure the pupils understand the illustrations. Teachers seldom realize how meaningless to many pupils are the diagrams, illustrations, and sketches in the average text so readily written and understood by adult teachers.

8. To help both the average and the dull-normal pupil with the lesson, it is good practice to place before the pupil a list of specific questions to which he can find and write specific answers. This device will often be the only guide that the dull-normal or slow pupil will be able to understand or to follow; yet these same questions will serve as an excellent study guide for the better pupil. The series of questions can be placed on the blackboard or mimeographed. Ordinarily it is a good practice to require that the boy answer the questions in short declarative sentences.

9. It is good practice to require an outside assignment necessitating the performance of some simple task by each pupil after every class period. This assignment, however, should review a lesson in most cases and not require advance work on material not yet explained. The assignment should be rather short; it should be possible of achievement by most of the pupils, and should tend to summarize and coordinate work already covered. The effectiveness of this device, of course, depends upon teacher checkup to determine whether the pupil has actually done the work assigned.

10. It is good practice to preserve some of the pupil's work. The pupil may keep a notebook, the teacher may have a steel filing cabinet in which each boy has a folder containing some of his work done in that class. Examples of shopwork may be exhibited in a show case or cabinet.

11. Do not expect the dull-normal boy to cover as much material as the superior pupil.

12. Parallel the class discussion with a written or printed outline on the board of important points as they are developed. As this outline develops during the class period, it will tend to summarize and coordinate the entire discussion on the subject. This is standard procedure for our foremanship conferences, why not for more of our classrooms and shops?

Instead of an outline, a brief summary of the discussion or of the lesson may be utilized to good advantage. A summary will tend to crystallize what has been said and studied. A series of summary sentences will become a summary of the whole. The teacher should regard himself merely as the leader of a conference group rather than as a teacher. As leader, he must skillfully guide the thinking of the group by any practical device available.

13. When taking up new work, the teacher should read over the material with the pupils. Ordinarily, the oral reading done at this time should be done by the teacher, not by any pupil. The oral reading of new units by the teacher is a good device because it permits the pupil to forget about the mechanics of reading, with which he may have difficulty, and to concentrate to a greater degree on the content. The teacher should also take time to explain and to make clear any difficult passages.

14. It is a good practice to keep a list of new terms as they appear. The ability to read in a special field often depends upon the specialized vocabulary which the pupil possesses. Vocabulary work, therefore, should be a part of the regular work in the various subjects.

Shop Management and Maintenance

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Some directions which will aid in keeping the shop in an orderly and efficient condition.

Industrial-arts work differs from the regular classroom studies in that considerable equipment is used and much individual and group activity is involved. This necessitates specific methods of management and maintenance to make certain that every regularly enrolled student in industrial-arts work can carry on to his very best advantage.

It should always be kept in mind that students enrolled in an industrial-arts course are privileged to use the facilities of the department to carry out the work in the course only and that *all tools and equipment must be used in the proper manner*. The shops and the equipment must not only be kept in the best possible condition at all times, but they must be preserved as well for the great numbers of students who will use them in future. Work can always be carried on best in an orderly manner and with tools readily accessible and in good condition.

To assist in offering every industrial-arts student an opportunity to do his very best and at the same time to conserve the equipment for future use, the following regulations must be followed:

1. *Hours of work in a shop*. Every person enrolled in a course is entitled to use the shop facilities during the hour scheduled and all other laboratory hours checked on his schedule card. He has no rights in the shop at any other time except by special permission in writing.

2. *Work done in the shop. Every piece of work done in a shop* must be approved by the instructor *before* it is *started* and it must be done in accordance with a plan which has been approved. *No work will be permitted if the plan sheet is not at hand and being followed.*

3. *Conduct*. If at any time it is found that tools are being misused, or that conduct or attitude is such that it interferes with the free progress of others, it will be necessary for the person involved to forfeit all special privileges.

4. *Use of Tools*. Every person regularly enrolled in an industrial-arts course must have tools and equipment to meet his needs and we plan to make these available. *Along with the privilege to work in the shop comes a definite responsibility* to keep things in order and to avoid encroaching on the privileges of others. Every member of a class must assume definite duties which will be assigned to equalize the responsibility and to avoid injustices.

5. *Dismissal*. The following regulations

relative to dismissal and clean-up must be followed implicitly:

a) When the clean-up signal is given, stop work *immediately* and put all tools in their *proper* places after they have been cleaned.

b) Store all materials and unfinished projects in the proper place.

c) Remove everything, except permanent fixtures or machines, from benches and brush them clean.

d) Clean and polish all metal parts of machines.

e) Report any broken or defective tool to your instructor. Note especially broken or loose hammer handles and battered chisels.

f) See that all cabinet and case doors are closed.

g) Put all woodworking benches in line.

h) Place stools in the proper places.

i) See that the window sills are free from projects or material, and properly dusted.

j) See that all pieces of scrap are in scrap boxes or cans and *not* on the floor.

k) See that all finishing or oily cloths are in metal cans.

l) See that everything is in good order.

m) *Do not leave your clean-up station until your clean-up work has been checked and approved by your instructor.*

If these instructions are followed, clean-up will not be unpleasant, the time required will be but two or three minutes, and everything will be in good condition.

An Industrial-Arts Consumer Unit

William J. Micheels

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An example of a unit that stresses the consumer values inherent in industrial-arts work.

Furniture

Furniture in the home is so commonplace, that most of us never realize the history behind the various pieces, nor do we know the problems that might have confronted our parents when they bought the particular furniture that is in the home. This unit is to acquaint the student with some of the problems that come up in buying furniture, in placing it properly in the room, and in caring for it. This material is a simple outline of the topics that will be discussed in class, and it is not intended to cover all of the points one would study were he making a detailed report on furniture. Each of us, as a consumer, should know some of the more important points to be considered when discussing furniture.

Plan to be Followed in Studying this Unit

Several of the more important factors entering into the subject of furniture are discussed under separate headings. This does not mean that one is more important than the other, but the divisions are made in order that it will be easier to understand each one. When buying a piece of furniture, comfort, utility, beauty, and rigidity are some of the factors that must be considered individually and as a group.

The slides, pictures, and other illustrations shown in class, together with the additional talks, will cover more ground than is found in this outline, but the material on these pages will help the student in completing outside assignments.

Assignments. Several assignments are listed. Some of these will be done in class, while others will have to be done at home. Be sure that you have completed each of the assignments when the unit is completed as all of your work is to be handed in. Questions which appear in various places are to be answered in writing unless you are told otherwise by the instructor.

Introductory Questions:

What should be the distance from the top of a desk to the floor if one is going to use it as a writing desk?

If a hot plate has burned a ring in your dining-room table top, how can this be taken out?

What would you look for if you had to buy an easy chair?

What is the difference between cheap and expensive furniture?

Can furniture be placed anywhere in a room?

What is meant by *period* furniture and why is it desirable to know something about this when buying furniture?

Comfort

The main feature to consider in selecting chairs, tables, and other pieces of furniture is that of comfort. Any kind of chair will not satisfy, neither will a table that is too high be comfortable. The only way to make sure of getting what you want is to try out several before buying. Furniture has been standardized just as have shoes, collars, suits, hats, etc. This means they have certain sizes for certain people. Furniture is usually made to fit the average person, 5 ft. 8 in. tall, and it will be acceptable to the majority of people. Special furniture is made for persons who are abnormal in height or weight. The common measurements of a dining-room chair are shown in Figure 1, and are based on factors which give the greatest degree of comfort.

Assignment. Measure several chairs at home and see how they correspond to standard measurements. Fill in the measurements in Chart A.

General Statement of Help in Knowing Comfortable Furniture

The seat of a chair should be approximately as high as is the distance from the knee to the floor. Eighteen inches has been accepted as the standard.

The depth of a chair seat is important.

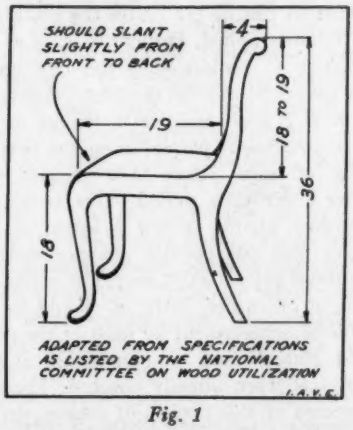

Fig. 1

CHAIR NO.	HEIGHT OF SEAT	LENGTH OF SEAT	SLANT OF BACK	OVERALL HEIGHT	DOES SEAT SLANT?

Chart A

One becomes uncomfortable if the seat is too shallow or if it is too deep and there is no chance to use the back rest. Nineteen inches has been set as the standard for this measurement.

The slant from the seat to the top of the chair should be about 4 in. From 17 to 19 in. above the seat there should be a cross slat for the shoulder blades to rest on.

If chairs are to have arms, the best height for these is about 7 in. above the seat.

In selecting the easy chair it should be chosen for the particular person that is going to use it. One person may sit up straight; another may lounge in his chair. For each of these a different type is desirable.

The height of a table top upon which one is going to write should be 30 or 31 in. from the floor. If a typewriter is to be used it should be 24 to 26 in.

An end table should be about as high as the arm of a davenport or approximately 25 in.

Parts of furniture built too close to the floor become dust collectors. Try to have them at least 6 in. above the floor.

Little conveniences are often desired in furniture, such as plush-lined drawers for silverware, sliding jewelry trays, separate shirt compartments, etc.

Questions

1. Why should furniture parts be built higher than 6 in. off the floor?
2. Why should a table used for writing and one used for a typewriter have different heights?
3. If a person does not feel comfortable when sitting in a chair or seat, what may be the cause of this?
4. What is meant by *standardized measurements?*
5. Why should an easy chair be bought especially for the person who is going to sit in it the most?
6. List the things to look for in selecting comfortable furniture.

Utility

Furniture for the home must have utility if it is to serve its real purpose. By this we mean that it must be useful and do the things that are expected of it. For instance, if your mother were looking about for a sideboard in which to store silverware and table linen, she might find one made of beautiful wood and finished very nicely, but if it were not large enough there would be little sense in buying it. You would not want to buy a large dining-room table to use in a small apartment. Neither would you buy an overstuffed easy chair for the dining-room table, no matter how nice it looked and how comfortable it felt.

Besides picking out furniture for its right use, we must think of where it is going to be placed in a particular room. It cannot be scattered about in any manner and still serve its useful purpose. Most furniture belongs in a particular group and should be placed somewhere near the other pieces of that group. Examples of these groups are somewhat as follows:

Reading and conversational group — chairs, tables, lamps; situated so that it will be easy to read and still carry on a comfortable conversation.

Writing group — desk, chair, lamp. Best placed near a window for adequate daylight.

Vanity group — If a mirror is used, this group should have plenty of light whether it is in a bedroom or not.

Each of these groups should be so placed that it seems to fit naturally into the room and harmonize with the rest of the fixtures. Some homes will have more of some furniture than will others. For instance, if there were several children going to school, it will be necessary to have space and furniture for them to study. The well-furnished home is not a museum and the furniture should be made to harmonize with the surroundings and with each other. One thing is always noticeable: furniture placed where it will not do the most good usually looks out of place. You would not expect to see a dining-room table in the bedroom; neither would you expect to see a davenport in the average kitchen.

Assignment. By carefully noticing how your mother has the furniture placed in one of the rooms at home, you will begin to see that she has definite ideas where each piece should be. Your assignment is to make a free-hand sketch of your living room at home and then put in the furniture as it is placed.

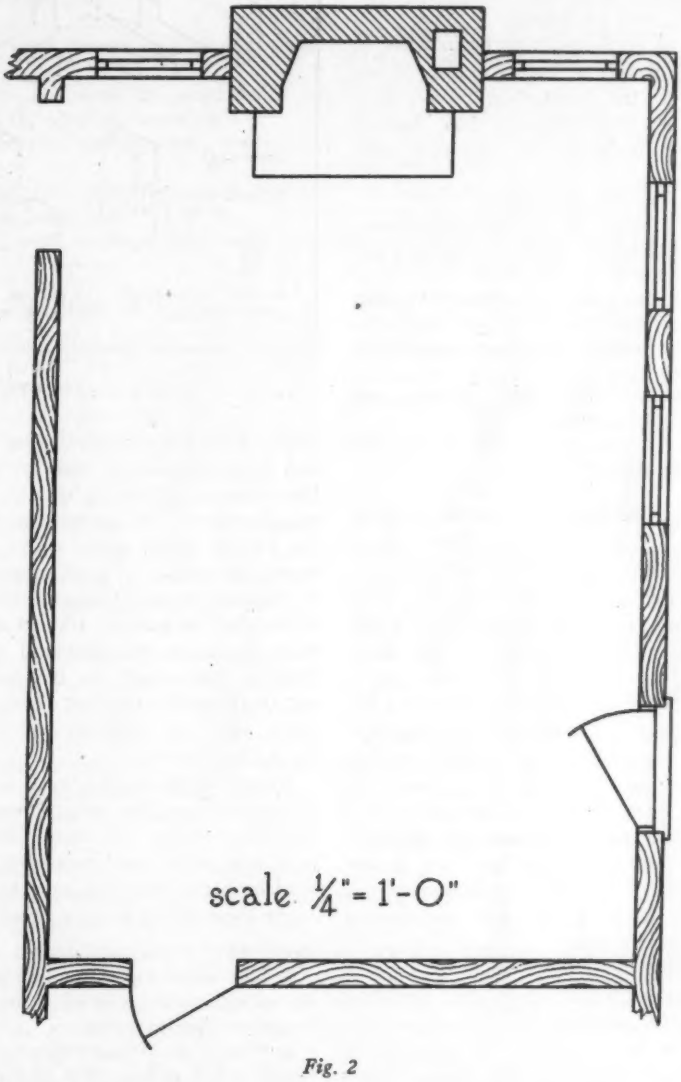

Fig. 2

Questions

1. What is meant by utility?
2. Why do you suppose furniture is placed in groups?
3. When will a piece of furniture nearly always look out of place?
4. Explain why a piece of furniture may be comfortable and still not have utility.

Assignment. In Figure 2 is shown a plan of a living room. There are two doors; one leading outside and the other going into another room. The open space at the right and top denotes an arch going into the dining room. There are four windows and a fireplace. Your assignment is to *place furniture in this living room as you would like to see it.* Keep in mind all of the points that have been mentioned from the standpoint of utility. Be sure to include lamps and any other furniture which you think necessary.

Sketch in very lightly to begin with, in order that it will be easy to erase. When you are sure the furniture is as you want it and when the instructor has checked the sketch, draw in the furniture with heavier lines.

Questions (Do not write out)

1. Should there be a direct passageway from the outside door to the dining room and to the inside door?
2. Should one group of furniture be placed near the fireplace?
3. Is it important to utilize the space near the windows?
4. Should one think about the coats and hats of visitors coming to call?
5. Will you want to tell how big the rest of the house is?

Construction Features in Furniture

In picking out a good piece of furniture, it is necessary that you are satisfied with the way the article is put together. It is possible to have a chair or davenport which looks very nice on the outside, but which soon begins to wobble and come apart. This is the result of the way in which the various pieces of wood are put together. There are several ways of putting together two pieces of wood; some of them are stronger than others and for this reason we are going to look at some of the more common joints found in furniture. A simple knowledge of these constructions will be a help in asking intelligent questions of a furniture salesman.

The first thing for a customer to look for is nails. While some good furniture may have a few nails in it, it is not possible to make as serviceable an article if it is held together by nails alone. This is the first sign of inferiority. Another place to look is at the drawers. Drawers which are not made properly will rattle very easily and, if not, they will be too tight to slide properly. See if the article has some kind of finish on the unexposed parts. Not all good furniture has this, but most of it has. This helps to keep out termites and to lesson the damages that might be done by atmospheric conditions. Ask the salesman which kind of joints the piece has and if they are invisible. If he does not know, he can easily find out from the buyer. This sort of questioning is important if one is to get the most for his money. The following quotation from the furniture specifications of the quartermaster corps of the United States army shows how they stress the quality of good construction:

"In order to be strong and durable, furniture shall be securely framed and braced throughout, and mortised and tenoned or doweled throughout, in the most skilled and workmanlike manner. Parts subject to stress shall be strengthened with glue-blocks and screws."

Figure 3 shows the various kinds of joints used in the construction of most furniture. After you have looked these over and asked any necessary questions, read over the foregoing paragraphs again, to fix these things in your mind.

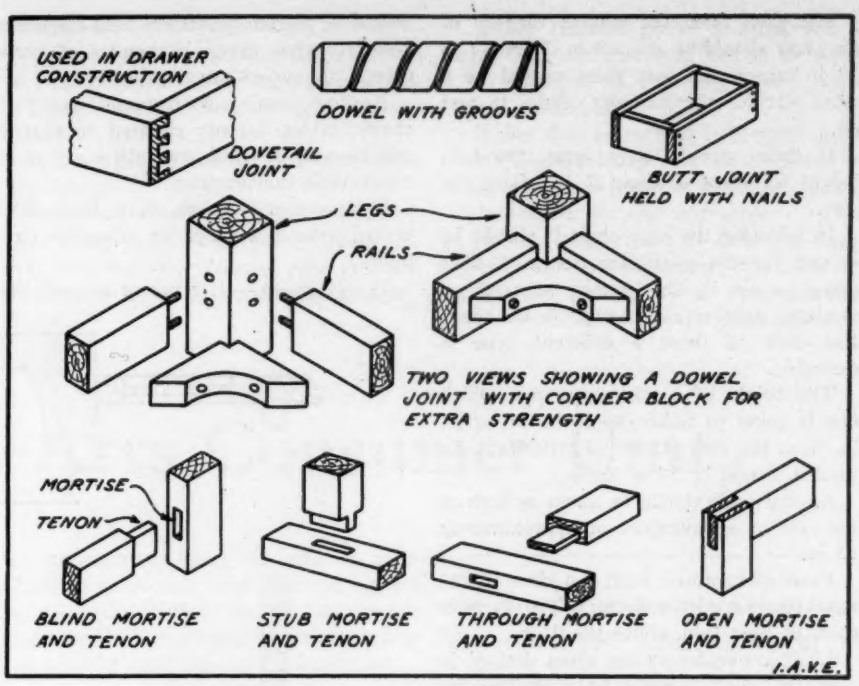

Fig. 3. The various kinds of joints used in furniture making

Questions

1. Why won't a piece of furniture put together with nails be as strong as one which has other types of joints?
2. Why is it hard sometimes to tell just which kind of joints a piece of furniture has?
3. Why is a dovetail joint the best to use in drawer construction?
4. What is used to make these various joints stay in place?
5. How can one usually tell a good piece of furniture by looking underneath?
6. List the names of the various joints illustrated in this lesson and tell where they can be used.

Woods Used in the Construction of Furniture

In 1931, 92 per cent of all furniture in this country was made out of wood. Since that time, metals and plastic materials have been making considerable progress, but very much furniture is still made of wood. For a study such as we are making, it would be impractical to consider all of the kinds and types of wood used, in fact it takes years of careful study to identify all of the 100 or more different woods used commercially. In our study, we will look at only a few of the more common woods.

The terms *hardwood* and *softwood* are often given in classifying the various types. It is rather difficult to differentiate between them because some of the softwoods are harder than the hardwoods. This is due to the fact that the real classification is made according to the type of leaves which the trees have. Hardwoods, such as walnut, oak, gum, and maple, have flat, wide leaves which they usually shed in the fall. Softwoods, such as the pines, spruces, or cedars, have needles or scale-like leaves which they usually retain throughout the winter.

About 88 per cent of the woods used in furniture construction are hardwoods from this country; 8 per cent are native softwoods, and only 3 per cent are imported hardwoods, such as true mahogany, Spanish cedar, and others. In 1928, 449,000,000 board feet of gumwood were used in this country for commercial purposes. This is only one of the many woods which were used, but it gives some idea of how much wood is consumed each year. Many of the more expensive woods are cut or sliced into thin veneers and glued to thicker

pieces of wood for strength. Plywood is a form of veneer, although several layers are placed together or laminated and with the grains running different ways. This gives a thin piece of wood more strength than if it were only one piece. Study samples of these various kinds of wood if occasion offers.

The following list contains the names of the more common woods used in the construction of furniture in this country:

Hardwoods: Walnut, tupelo, ash, cherry, magnolia, cottonwood, butternut, maple, basswood, elm, hickory, oak, birch, beech, holly, sycamore, red gum and sap gum, red alder, chestnut, yellow poplar, *faux satine* (false satinwood).

Softwoods: California redwoods, southern yellow pines, eastern red cedar.

Imported Woods: True mahogany, satinwood, rosewood, ebony, teak, purpleheart, snakewood, koa, tulipwood.

In learning to identify a few of the more common woods used in furniture construction, the best method is to study samples and see the various qualities they possess. It is well to study the following kinds of cabinet woods:

Walnut. This is almost an ideal wood for furniture because it has the qualities of beauty, strength, and durability. It was used early in history and some member of the walnut family grows in most parts of the world. American black walnut is the name given to that found in this country. It is brown in color and has beautiful grain. A member of the same family is known as *butternut,* but this wood is softer and somewhat lighter.

Oak. This wood is being used rather widely again after having been neglected for a while. Much of the early furniture was made of this hardy and strong wood. It is rugged, usually has a pronounced grain, and can stand more abuse than many of the other woods.

Red Gum and Sap Gum. These woods are mentioned because they are used more than any other in the construction of furniture. They are not as expensive as walnut, but are often used in imitation. The even grain of this wood makes it ideal for cheaper furniture which is to be finished in imitation of the more expensive kinds.

Eastern Red Cedar (Also called Aromatic and Tennessee Red Cedar). This wood is known to most of us because of its extensive use in the making of chests. It can be identified by its distinctive red color and by its characteristic odor. The odor is the quality which makes it desirable in the construction of mothproof chests.

Southern Yellow Pine. This wood is being used more and more in the making of kitchen furniture, cabinets, linen closets, etc. It is a softwood and cheaper than most of the other woods mentioned. Because it contains resin, care must be taken in finishing or the resin will work its way through the finish.

True Mahogany. This is a well-known wood yet many are fooled by imitations. It is reddish-brown in color, is readily worked, does not warp easily, and takes a beautiful finish. True mahogany and walnut have about the same extent of use in the making of fine furniture.

You may have furniture in your home made from other than the woods mentioned here, but these are common and serve to give us an idea about the various species. When you see a piece of furniture that strikes your eye, ask what kind of wood it is made of. After several such experiences, you will be able to tell for yourself what kind of wood was used in making a given piece.

Questions

1. Which wood has the most extensive use in this country?
2. Describe and name the wood which is almost ideal for furniture construction.
3. Which wood is used in making mothproof chests? Why?
4. What is a more correct way of classifying hardwoods and softwoods?
5. Explain what is meant by plywood and veneer.

The Finishing of Furniture

The finishing of a piece of furniture is very important if one is to get the most out of the article. In days gone by, people little realized this and often put a coat of paint over walnut or some such wood not knowing that they were destroying the beauty. A cheaper wood could just as well have been used and the results would have been just as good. Even today many people do not realize the part that the finish should play in the selection and care of furniture.

There are many ways to finish wood or metal, but for our purpose three classes are sufficient: (1) Natural finish with only a preservative or finishing coat; (2) stain finish to bring out the beauty of the wood; (3) paint or enamel finish which hides the grain of the wood and gives an opaque coloring.

In expensive furniture, the beauty of the wood must be brought out, and several different methods are used in doing this. Stain is the method or means most commonly used and the one which we will inspect. After stain is applied, the wood is usually given a filler to fill up the pores of the wood and make them dust free. After this process, a coat of shellac is often applied to act as a sealer and then several coats of varnish are put on to give the desired gloss and make the finish resistant to wear. The final coat of varnish is usually rubbed with a fine abrasive (in most cases pumice stone) and this gives a semigloss finish which is commonly know as an eggshell finish. In a cheap piece of furniture, less time will be spent on the finishing and one can often detect cheapness by carefully inspecting the finish. It should be even and smooth and should not scratch easily when a fingernail is rubbed across an unexposed part. In cheap furniture, stain and varnish are mixed together and put on in one operation.

Assignment. You will be given several small samples taken from a piece of birch veneer. The assignment is to stain these with the water stain placed at your desk. Birch is often used to imitate mahogany and the stains which you will apply show how different effects can be obtained by using different colored stain.

Listen carefully to the instructions and then read over the following directions to insure good work. These samples are to be pasted on a piece of paper and handed in at the completion of the unit.

1. Sand the pieces very carefully and ***with the grain.***
2. Wipe each piece off carefully.
3. Apply the stain with a paint brush. For a light finish, the stain may be rubbed off. For a darker finish, apply another coat.
4. Clean the brush thoroughly in water.
5. Repeat the above operations until you have stained all of your samples, each with a different color.

Questions (Written)

1. Why is it considered wrong to paint a piece of walnut furniture?
2. What are the three ways usually used in finishing wood?
3. List the procedures in finishing a piece of furniture. First the stain is applied. Then what happens?
4. Why is a filler used on certain woods?
5. How is cheap furniture finished?

Period Furniture

Throughout the various periods of history, different designs have been emphasized in the construction of furniture. A man or group of men may have developed a certain design that still bears his or their name. Or maybe the name given to certain furniture designs is taken from the name of a particular era in history or from the name of the ruler of a country. There are some forty different eras whose furniture designs might be considered, but only ten or twelve have exerted any outstanding influence.

Some of the more important periods are the following: Gothic, Italian Renaissance, French Renaissance, Spanish Renaissance, Jacobean, Louis XIV, Early American, William and Mary, Queen Anne, Early Georgian, Louis XV, Chippendale, Brothers Adam, Hepplewhite, Sheraton, Louis XVI, French Empire, Duncan Phyfe, American Empire, Modern.

In figure 4 are shown some of the characteristics common to several of these periods. This will help you to realize what is meant by the classification into periods.

These examples are very limited, but they show the leg of a chair, the back of a chair, a table leg, or some such part to illustrate the differences in the various periods.

Care and Repair of Furniture

Furniture must have constant attention if it is to retain its beauty and texture. It should be dusted every day with a lintless cloth and from time to time should be washed and polished. Sometimes spots from hot dishes or stains appear on the finish. With a little study and care these can usually be taken off. Nicks, scratches, and bruises can also be taken out and most furniture stores will be glad to tell one how this can be done. Stick shellac can be used to fill scratches or nicks, white shellac or dye can be used to cover simple scratches and the list of ways to ingeniously fix these things goes on and on. In putting a good wax polish on furniture there is only one best way to make it last — rub, rub, rub. Write down the various methods of taking out spots and nicks as given by the instructor. Your mother will be glad to know these.

If a piece of furniture is broken, it may be fixed at home or taken to a shop which specializes in the repair of furniture. Many people enjoy fixing things around the house and in most cases are able to do acceptable jobs. If the glue has dried out of a joint, one should remember to scrape all of the old glue off before applying the new. If a leg has been broken off, it may be put on and reinforced with a dowel to give it added strength. These are two examples of the things one is able to do if he is interested in this kind of work. There are many books on the market which have been written especially for the home craftsman and the instructions are usually very simple. Serious breaks should be taken to a shop which specializes in fixing furniture. It is usually cheaper in the long run to have the best possible work done in order that the same thing will not happen again.

Questions (Written)

1. List the things which should be done to keep furniture in good condition.
2. Where could one find out about fixing scratches or marks on a table top?
3. Why do you think it is necessary to remove all the old glue from a joint that has come apart?
4. What are some rules to be followed if one is to keep from breaking furniture?

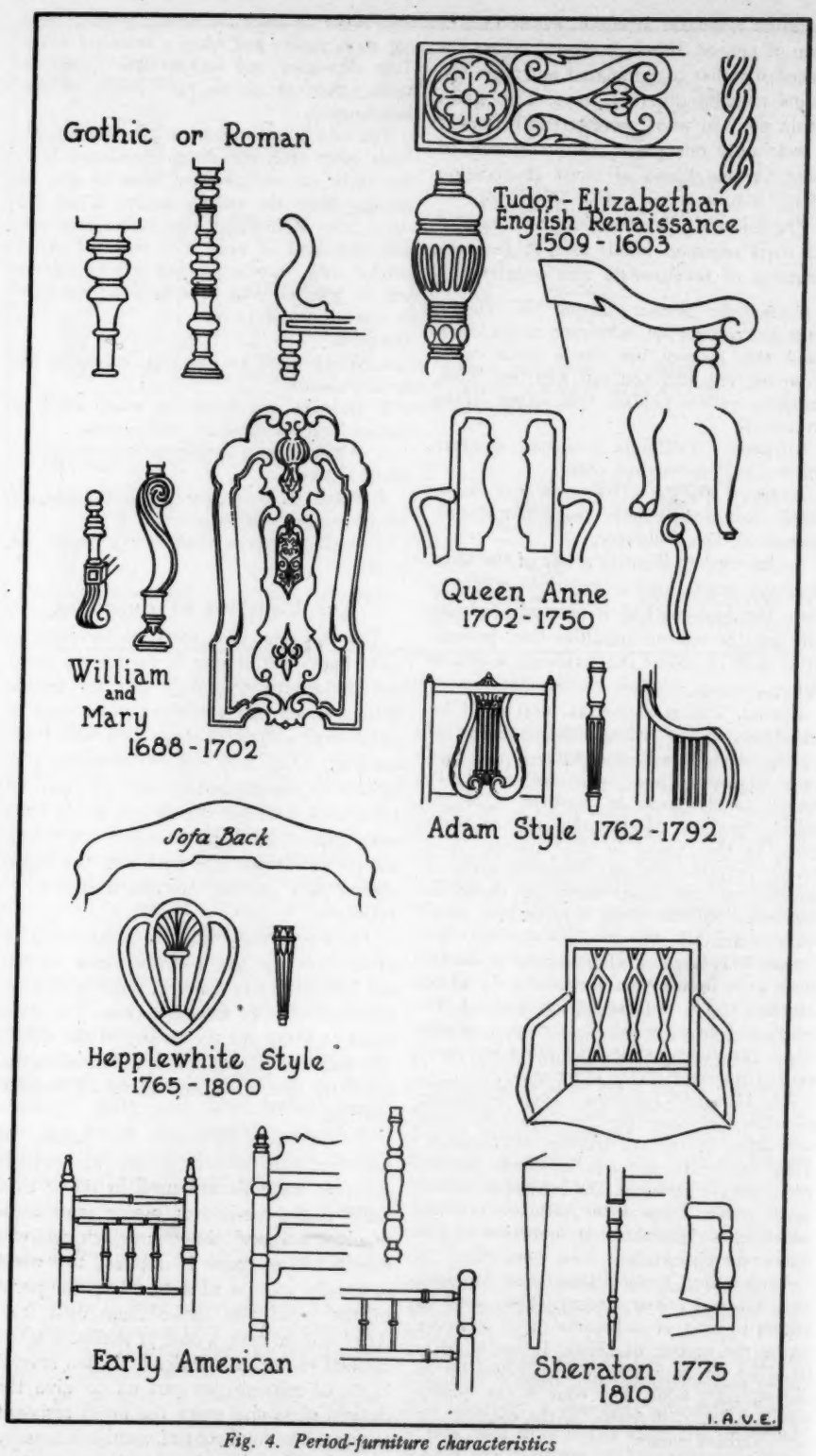

Fig. 4. Period-furniture characteristics

A List of Words Used in this Unit

Bed posts — The pillars supporting the canopy over a bed or the bedstead legs themselves.

Butt joint — The joint made when two pieces of wood are placed against each other and held together by nails or screws. This is the poorest kind of joint to use in table and chair construction.

Carving — A form of ornamentation used on furniture. It is produced by cutting or chiseling a design on the surface.

Chesterfield — An overstuffed sofa or couch having two sides or ends.

Corner block — The triangular block placed in the corners of a piece of furniture to give added strength.

Dovetail — A joint made so that one piece of wood interlocks and fits into another. This is used widely in drawer construction.

Dowel — A pin or peg used to hold together two pieces of wood. It extends into both pieces thus giving rigidity.

Fluting — The small channels chiseled out of certain chair or table legs.

Highboy — A tall chest of drawers mounted on legs.

Inlay — The design that is formed on wood when a constrasting wood is placed in the cutout part of the surface. A brown wood may be inlayed with a design of white wood.

Lacquer — A high-luster finishing material which dries quickly and is used rather widely.

Laminate — To build up wood or other materials in layers. The construction of plywood is an example of this.

Leg — The support upon which a piece of furniture rests. The designs of the legs vary with the different periods.

Miter — An angle cut in the edge of wood. Two pieces of mitered wood will form a square corner when placed together.

Mortise and tenon — A joint widely used in the construction of furniture. The mortise is a hole cut into the table leg and the tenon is the part of the rail which fits into the mortise.

Shellac — A gum derived from little insects which live on trees in India. From this gum is made the finishing material which is used for many purposes.

Spiral turning — A twisted form of turning resembling a screw.

Spool turning — Continuous turning of a spool-like pattern; often found in early American furniture.

Square leg — A straight square-shaped leg with beveled edge, used by several early designers.

Stain — (Write in your definition of this word).

Three-ply — Another name for plywood which is made up of three layers.

Upholstery — The coverings, draperies, or cushioning applied to furniture. Leather, tapestry, plush, and the like, may be used for upholstering.

Varnish — A finishing solution made from copal gums and linseed oil to give a transparent shiny finish to wood and act as a preservative.

Veneer — A thin piece of wood, usually of a choice pattern, glued to a solid piece of wood or plywood.

Lessons for Young Workers — VI

Thomas Diamond

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The sixth of a series of suggestive lessons designed to help students of industrial arts and vocational education.

Production, the Basis of Prosperity

In some of the previous lessons the idea has been expressed that co-operation is necessary in industry if the industry is to be successful.

Unless workers are contented they are not likely to co-operate.

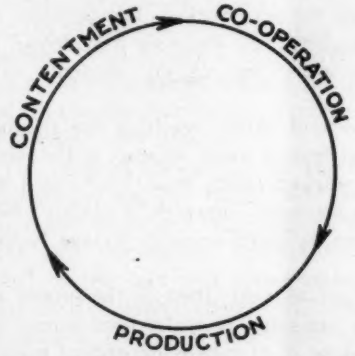

Fig. 1. How production is influenced by contentment and co-operation

Unless there is production in the factory there cannot be financial means of satisfying the worker and making him contented.

Unless there is co-operation among the workers adequate production is impossible.

The endless nature of this thought is well illustrated in Figure 1.

If you follow this circle in the direction of the arrows you will find that contentment leads to co-operation, co-operation leads to production, and production leads to more contentment, and so on, around the circle as long as you want to continue.

The basis of this circular journey is production, because it is out of production that the means for paying wages and dividends comes.

The remark if often made that capital pays wages that are too small. It should be made clear that capital does not pay wages, nor are wages paid out of capital. If a firm paid its wage bill out of its capital it would soon be in the bankruptcy court. Consequently wages must be paid out of production. If the wages are to be increased, this increase must not be drawn out of capital, instead an endeavor must be made to obtain the additional income necessary by increasing the product.

Regardless of the size of the factory, therefore, the greater the production of each worker the greater the income of the firm. As its income increases, its ability to pay higher wages and larger dividends increases. This results in greater contentment among the workers and stockholders, which induces them to co-operate still more closely and thus produce still more than formerly.

The points to be emphasized in this lesson are:

1. Production is the basis of prosperity.
2. Through increasing production the employer is able to increase wages or decrease the price of his goods.
3. Wages are not paid by or out of capital.
4. Wages can only be paid out of income.
5. An employer cannot afford to pay you more if you do not earn more.

The Cleveland Trade School exhibit at the Foundrymen's and Patternmakar's convention, Cleveland Auditorium, Week of May 14, 1938

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

J. J. Metz, Editor

The Use of Pretests

There are many shop teachers, as well as others, who object to the use of tests in the schoolroom. Some decry the evil effect tests and examinations may have on the nervous systems of their students; others make the bald statement that tests do not give the true picture of what the student has acquired from a certain course, and many advocate the abolition of all examinations and tests.

In spite of all these contentions, and in spite of the ineffectiveness of some forms of examinations, there still seems to be real need for measuring, in some way, what effect a course has had on the student who has taken it.

Practically every life situation definitely tests the individual in some way or other. The salesman who makes no sales is dismissed. He has not passed his test. The mechanic who fails to turn out accurate work, soon finds himself without a job. He, too, has failed in his test. The designer whose ideas fail to work out in practice, gets no further assignments. Life applies tests and renders harsh decisions. Life does not ask whether its tests produce nervous disorders in the individual; it simply tests for fitness and then renders a judgment.

Since the school is to prepare for life, it does not seem to be out of place that the school also prepares the student to bear up under the strain of being tested, since that is life's way of finding out what the individual knows or what he can do.

All of this seems to point to the need of what might be called *terminal testing*, that is, testing after the student has been exposed to certain educational processes. It does not show the need for so-called pretesting. Pretesting, however, also finds its place in life. Before an apprentice is accepted, in most cases, he puts in a three-month probationary period. The army and navy apply rigorous tests before they admit applicants. There are many license examinations which applicants for certain trades must take before they can be admitted to positions of responsibility in their particular trades or occupations.

Is is not advisable for the school, then, to copy from the life situations to which students will be subjected later on, and adopt methods which demonstrate to the student what he can do well, what he can do only moderately well, and what he cannot do at all? Of course, the school must do its testing from the viewpoint of helpfulness. The outcomes of the tests must not leave the student in a hopeless mood, but must be direction pointers on the way to improvement.

For this reason, pretests are useful. Of course, there are those who object to pretests, because to them a student who is just starting out in a certain course is to be looked upon as one who knows absolutely nothing about the so-called new subject. Every shop teacher, however, knows that there is a wide difference between the members in a starting class relative to knowledge applicable to the work about to be taken up. The boy whose father has a home workshop may know a great deal about tools and their uses. It is true, he may not know how to use them properly, but he is acquainted with them at least. Is it well for the teacher to be aware of the quantity and quality of this foreknowledge possessed by some of his students? It will be, if he has arranged his work so that individual difference can be properly accommodated in his class. He will, of course, not care to know about them if his course is laid out without flexibility.

For the progressive shop teacher, however, the pretest is a valuable teaching tool. It shows him the condition of the soil which he is about to cultivate. To him this knowledge is very important. The student who is subjected to the pretest must, of course, be informed just why the test is given. He must be told that his score will not affect his final standing in the course at all. He must be sold on the value of knowing where each individual stands at the beginning of the course, and his appreciation for the teacher who approaches his task in so thorough a manner will surely not suffer.

Let's have more pretesting.

Safety! Safety! Safety!

By the time this issue reaches the reader, the school year 1938–39 will be in full swing. The shop teacher, be he in an industrial-arts or in a vocational-school shop, will have passed some exceedingly busy hours getting the educational machine properly oiled and running.

He may in this way have overlooked how necessary it is to inaugurate a strenuous safety campaign in his shop from the very first day. Many of the students who have entered the school shop since the opening day have had little or no experience with shopwork. Others who have spent several years in industrial-arts or vocational work, have returned to continue their studies. All of these are surrounded with many edged and power tools which possess potential possibilities for injuring and maiming the careless worker. The problem that confronts every shop teacher from the very first school day is, "How can I make every one of my students safety conscious?"

Many different methods of safety teaching are in vogue. All of them contribute at least a small impetus to the nation-wide drive to make our workers safety wise. That much more effort in this direction is necessary, however, is plainly evident from the appalling figures gathered annually by the National Safety Council.

The beginning of the school year, then, is the proper time to plan for a strenuous campaign to make your school shop safe. How this is to be done is, of course, dependent upon the decisions of the individual teacher. It is necessary, however, that a conscious effort be made to so stress the idea of safety that the student not only gets an academic conception of the need for safety but learns to continually practice it in his school-shop work until it becomes habitual. To accomplish this result it is well not to confine the teaching of safety to but one method.

Some instructors have found a two- or three-minute safety discussion at the beginning of each shop period very helpful. To this may be added such tested methods as danger signs judiciously placed on or near machinery that is to be used by the students. Safety slogans and safety bulletin boards near the toolrooms also are effective.

Whatever method is used, however, care must be taken not to have it become too mechanized. The object is to make safety instruction effective, hence it must be dynamically

presented so that the student remains conscious of it as something which he must continually keep before his eyes.

It is only if every shop teacher earnestly attacks the safety problem that real progress will be made, and that the appalling lists of maimings and murderings to which America has seemingly become accustomed, can be definitely curtailed.

Things Which the Student Must Acquire

No matter what the subject taught, no matter who the teacher, the great objective of education — to prepare the student for life — may never be lost sight of. Every teacher, then, be he in an academic classroom or in a school shop, must shoulder his part of the burden of preparing the young for life.

Many shop teachers feel that their subject particularly contributes much to this objective. Much evidence may be presented to prove that they are right, especially by those who are teaching straight vocational work. Many of these teachers, however, overlook the fact that the possession of the knowledge required by occupation, trade, or profession, of itself does not suffice for a full, rounded life. There are other points of human conduct that are required over and above the skills and knowledges required to earn one's livelihood, and these must be interwoven into the work of every teacher. It is not safe to overlook them, nor to argue that the duty of inculcating them is the duty of some other teacher. All courses, all teachers must co-operate in helping the student in building up a wholesome personality.

This cannot be effectively done by indirect methods, and the school shop lends itself admirably for consciously building up habits which make for the student's future well-being. Shop students should, therefore, be encouraged by example, precept, and practice to acquire the habits of being cheerful; friendly; respectful of authority; respectful of the other man's opinion; loyal to one's home, school, associates; careful in picking one's friends; heedful in practicing the golden rule; and continually and usefully occupied at school, when at work and during one's leisure.

The value of the personality habits just enumerated, to the student who acquires them, could be developed at length, but this would be superfluous so far as the readers of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION go. Attention is merely called to the fact that these desirable habits and attitudes must be consciously striven for — they are not automatically acquired in either the industrial-arts or the vocational shops of our schools.

The Saving of Our Youth

Numerous reports and studies show that the population of our penal institutions is made up largely of the comparatively young. Of course, present economic conditions may have something to do with this state of affairs, as a large percentage of our youth, unfortunately, are leaving school at the end of the compulsory-attendance period without much hope or chance of finding employment.

The homes of many of these young people also are in a deplorable condition. The parents, too, very often are without employment, and the gloomy atmosphere which prevails because of this, makes the home a very uninviting place. The young, therefore, seek solace and pastime elsewhere, and all too frequently with highly objectionable companions. Under these conditions, many drift into evil ways, are apprehended for some misdeed of greater or less importance, and their life as "prison birds" has begun.

Many of the youngsters of school age, too, are getting farther and farther beyond the sphere of home influence. With the precociousness of modern youth, they not only lose respect for their elders who no longer can support a family, but they also show it plainly, thus helping to destroy all vestiges of a normally balanced home life.

The CCC camps have done a great deal to help the over-school-age group in this period of unemployment but there still remain in a large number of young people who, while remaining jobless, are in great danger of developing habits of an antisocial nature.

What to do with these young people during their enforced leisure is a serious problem closely connected with the training for leisure which ought to be given to the children of school age. It is not at all uncommon to find cases where those who have already left school become the leaders and instructors in crime to those who are still in school. Training for the proper use of leisure, and opportunities for actively engaging in wholesome leisure activities must, therefore, embrace both the in-school and the out-of-school groups.

But who is to furnish this training and these opportunities? In the larger cities, social centers, centers for the unemployed, libraries, museums, baseball grounds, tennis courts, golf courses, bathing beaches, and the like, furnish some opportunities for helping unemployed youth to pass the time which would otherwise hang heavy on their hands. But again, only a comparatively small percentage of the jobless avail themselves of these opportunities. In the smaller communities, of course, few or none of these advantages are, or even can be, offered.

The solution of this problem, therefore, is still far from complete, and it will undoubtedly remain so if the school will not take a leading part in working it out. Some school systems have already gone forward with the work. Not only are they offering greater opportunities for adult education, but their teachers have developed various types of club and hobby work for after-school hours, in their endeavor to reach and interest youth. As a result, an increasingly larger number of those who had already left school before finishing the twelfth grade are again taking up schoolwork, thus bettering their chances for the future.

All of this may mean considerable extra work for teachers. Much of it, no doubt, is and will have to be done without monetary remuneration. Teachers who engage in this work, however, are sure to receive an abundance of esteem and respect from the unfortunates whom they are befriending. They will also receive great satisfaction from the thought that they are saving and training many young people for a life of usefulness rather than permitting them, in their ignorance, to lay a foundation for a life of wrongdoing. The work appeals to teachers who are altruists, and fortunately, this missionary type who is willing to assume an added burden for the good of humanity is found in many places.

It is well to remember that the future of America depends on what is done right now. It is, therefore, to be hoped that many teachers of industrial arts and vocational education will volunteer to help in this crusade for the making of better Americans.

Suggestions for the High-School Art Department

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While this article is addressed specifically to teachers of art, instructors of industrial arts and vocational education will find it applicable to their own work as well.

It is sad but true that some of the art rooms in the junior and senior high schools are among the most cluttered-up rooms in the building. This may be partly due to the fact that art teachers in these schools have under their direct supervision and are responsible for thousands of dollars worth of equipment and supplies which must be used daily by hundreds of students. Frequently teachers are not allowed sufficient time between classes to take care of the supplies and equipment which are needed by the pupils, with the result that there soon is an accumulation of materials scattered about the room. The problem of the proper utilization of the supplies is a constant one. When space is limited, the budget reduced, and classes are crowded, it becomes even more important to economize in space, time, and money by means of careful planning.

Much has been heard about streamlining in recent years, and great efforts have been made by manufacturers to bring their commodities up to date. For many years, art teachers have preached *orderly simplicity, elimination of unessential details, harmony, unity, balance,* and the like, yet much of this teaching and preaching has been theoretical and there is little evidence that teachers applied it to the orderly arrangement of their classrooms.

The art room, above all, can and should reflect those principles of good arrangement, order, etc., which are considered desirable and practical, and which are expected of the students in their homes. This does not mean that the art room should be dolled up with *arty* decorations, or that everything must be stiff, formal, and inflexible, but that some consideration should be given to the proper placing of furniture, the storing of supplies and equipment, the manner in which wall space is broken up, and how cabinets, bulletin boards, clocks, and the like, are designed and placed.

The teaching of art in the secondary schools should not be confined to the making of posters, illustrations, and a few all-over patterns or designs on a two-dimensional surface. Art education should aim to develop those desirable habits, skills, and attitudes which make for a richer and fuller life. While it is desirable that the students should learn something about the great contributions of the arts to the history of civilization, and should have an opportunity to see examples of the work of the great masters of architecture, sculpture, painting, and the crafts of the past, through illustrations, slides, and visits to the art museum, they should further be made conscious of the important place of the arts in contemporary life and in their own immediate surroundings, in their homes, yards, clothes, the school, the classrooms, furniture, etc. They should also be made to realize the value of drawing, painting, modeling, carving, and kindred arts as creative and recreative outlets for latent ability and as a means of developing adaptability.

The aesthetic and the practical value of art should not be separated but should be emphasized and combined, because all art is practical if it serves a worth-while purpose. Drawing as a graphic language is of value to all; it should, however, not be taken as an end in itself, but as a means to an end. Talented and exceptionally gifted students should be encouraged and guided, and should be given greater opportunity to work out their individual problems without too much help from the teacher. The main problem of the teacher is to reach those many students whose contact with art will be limited and who in all probability will not have any instruction in art beyond what they receive while in the high school.

Since art is manifest in practically all of the things with which we are surrounded, and since color and design play such a vital part in our daily lives, it is most important that our young people in the junior and senior high schools be made aware of the significance of the arts as it affects their own lives and environment.

The more recent courses of study for the junior and senior high school seem to have become less voluminous and present a series of organized art problems arranged in a chronological and psychological sequence for use as reference by the teacher, together with a brief statement of the aims and objectives of the work. The course of study does not and cannot take the place of effective art teaching, but serves merely as a guide to the teacher. The final results depend upon the ability, enthusiasm, and initiative of the teacher and on the interest which can be aroused in the student. Where large classes are the order of the day and where mixed groups are placed together, individual and more detailed lesson plans could be worked out in each school in order to save time, and wherever possible the work should be planned and presented so as to integrate to a greater extent with the other subjects taught in the school. Special class or group projects of value should be encouraged wherever the opportunity arises. Slipshod methods of work, lack of concentration, and laziness must be discouraged in the art class as much as in any other class. Discipline is essential insofar as it is necessary for a group to work together with some degree of harmony and respect for the rights of others.

In order to make group instruction possible and effective, it is essential that first- and second-year students be scheduled as separate and distinct classes. Only in the case of advanced students it is possible or advisable even to attempt to carry on classwork with groups composed of students from different semesters. In some schools, altogether too much time has to be devoted by the art teacher to the making of posters, signs, drawings for the annual, stage settings, and a hundred and one requests which interfere with a well-planned course of study. The art department becomes the dumping ground for a great deal of work which, because of the undue repetition, has little educational value and limits growth for lack of new experiences in visual expression. One of the schools in Milwaukee, the Rufus King High School, has solved this problem by establishing a students' organization known as The Art Service Club. The purpose of this club is to serve the entire school community wherever possible by means of

students who are interested in the field of arts and crafts. Anyone, whether enrolled in an art class or not, may join the club upon recommendation of the homeroom teacher and the sponsor of the activity.

The art teacher is in charge of the club and regularly scheduled meetings are held twice a week in the artroom, during the 8th hour, during which time the art teacher is relieved of the homeroom duty.

A few of the activities of the club are enumerated as follows: Paint scenery for stage productions, prepare artwork for the annual; make cover designs; division pages; cartoons; make decorations for school parties; print school Christmas cards, tickets, programs, nameplates for rooms, design emblems for the athletic department; make cards; charts; maps; posters; match colors of wall paint to touch up scratches in various rooms; decorate flowerpots for the cafeteria; letter placards for the cafeteria; arrange bulletin boards, and the like.

The effectiveness of this plan has been ably demonstrated. It has proved of considerable help in relieving the art department of many unnecessary interruptions, while at the same time it has placed the responsibility for much of the work on the students. The establishment of one or more art-service clubs, under the direction of art teachers in each school, is to be recommended.

While art is listed as an elective subject in most schools, students are in many instances not permitted to elect the subject. There seems to be no agreement among secondary-school principals as to who may and who may not elect art. In some schools, principals permit only students with a high academic standing to elect this subject, while in other schools the principal encourages only those with a low academic average to do so. Quite a number of students are sent to the art class two months after the beginning of the semester and given double periods because they failed in some academic subject. The student frequently is made to feel inferior and is accused of being dumb whereas in reality he frequently is a student with a marked creative ability who will produce good, or even excellent work after his interest has been aroused. Although psychological tests which have been made show conclusively that a high degree of intelligence and creative ability go together, failure in one subject does not prevent an individual from being able to excel in some other (to him) more interesting activity.

A more liberal attitude regarding the value of the arts in education, together with a re-evaluation and a more intelligent co-ordination of subjects in the secondary school would be helpful.

The development and growth in art education in the junior and senior high schools in many cases has not kept abreast with similar development which has been made in art education in the grade schools. This situation can be remedied in part by more sympathetic support from high-school principals, and by better organized and more inspiring art problems and projects.

Introducing the Student to Mechanical Drawing

Clay A. Easterly

High School,
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Acquainting the student with the reasons for presenting a given course.

In the school as well as in practical life, the situations calling for ability to read drawings far outnumber those calling for ability to make the things shown on the drawings. Especially in most industrial-arts activities in the school, pupils are called upon to read sketches, drawings, or blueprints soon after they begin to work.

Industrial plants depend almost entirely upon blueprints to convey the designer's ideas to the mechanics in the various shops.

Language is defined as the expression of thought. Every educated person desires to be able to express himself readily and easily, to convey his thoughts so accurately that they cannot be misunderstood; and to be able to understand the exact meaning expressed by another person. But if we attempt to describe in words the appearance and details of a machine, or bridge, or building, we find it not only difficult but in most cases impossible. Here we must use another language, the universal graphic language of drawing.

Thus, when words fail to give a complete or accurate description we find books, magazines, and newspapers using pictures, diagrams, and drawings of various kinds. A written description of a new piece of furniture would have to be very long to tell all about the article described, and even then might be misunderstood. A picture would serve the purpose much better, but the picture would not show the exact method of construction and would give only the external appearance without telling about internal details and construction. It would be impossible to construct a locomotive or an airplane either from words or a picture. The pictorial methods of drawing are thus not suitable for construction work.

Fortunately another form of description has been developed by which the exact shape of every detail may be defined accurately and quickly. It consists of different views of an object arranged according to a definite system, with lines and figures added to tell the sizes. This is called mechanical drawing, and it forms so important a part of all industrial and mechanical work that it is called the "language of industry."

Drafting room, High School, Bristol, Virginia

The language of drawing has its own orthography and grammar and style, its idioms and abbreviations, and its study not only gives one the ability to express thoughts hitherto impossible, but develops the constructive imagination and the habit of exact thinking.

Learning drawing, then, is much more than simply learning how to draw. It is learning to read and write a new language, just as real a language as English or French.

A working drawing, or shop drawing as it is sometimes called, may then be defined as a drawing containing an adequate number of views of an object completely dimensioned and having sufficient notes to enable one to make the object without further information.

In machine drawing it is the usual practice to draw each part of a machine on a sheet by itself. Such drawings are sometimes called "detail working drawings," or simply "detail drawings." The same term is also used in architectural, structural, and other kinds of drawing, as for example, when a unit of the structure, such as a window, door, or steel column, is drawn by itself to show the details of construction.

In the commercial world, drawings are made for the purpose of manufacturing or constructing useful objects. In order to make an object of any kind, the workman must know not only its shape but also its exact size, the materials of which it is to be made, how it is to be finished, and many other bits of information which cannot be shown in orthographic views.

Our mechanical-drawing course has not been developed with the idea of specialization in any one field or trade. In view of the fact that there are 140 to 165 students enrolled in drawing each term, there will be many who will not enter any industrial field when they have completed their public-school education. In setting up aims for teaching the subject, we have been guided by this fact. Therefore, our endeavors have been to make the course worth while for any student who may choose to elect drawing as a part of his or her high-school course of studies.

The aims of our mechanical-drawing course may be summarized as follows:

1. To develop the power of visualization.
2. To strengthen the constructive imagination.
3. To train in exactness of thought.
4. To teach how to read and write the language of the industries.
5. To give modern commercial practice in making working drawings.
6. Manipulative skill:
   a) With measuring tools
7. To acquire related knowledge such as:
   a) History
   b) Science
   c) Mathematics
   d) Trade experiences
   e) Commercial practices
   f) Information about the nature and uses of certain materials
8. To develop habits of:
   a) Accuracy
   b) Neatness
   c) Thinking a problem through
   d) Honesty in construction
9. Ability to:
   a) Reason
   b) Co-ordinate brain and muscle
   c) Arrive at Proper judgments
   d) Be versatile
   e) Express constructive thoughts
10. Appreciation of:
   a) Good design
   b) Good construction
   c) Economic value and importance
   d) Dignity of labor

We have made every effort possible to keep our classroom presentation up to the standards of the new Virginia Curriculum. It has been found that a unit in mechanical drawing may be so constructed as to vary in length of time that it be applicable for almost any group of students. It is quite true that no group will make the same development in any given period of time. Our experience to date is that the unit idea for presenting drawing is a very effective method of teaching.

Unit I. How To Make a Working Drawing

1. Look at the object and decide upon the number of views that will be needed. (Two or more.)
2. Draw the border lines and title space.
3. Make temporary free-hand sketch of the object.
4. Figure the correct spacing between views.
5. Decide where and how each view is to be placed on the paper.
6. Dimension first the top view, beginning with the lengthwise dimensions.
7. Draw extension lines from the points you intend to dimension, then draw the dimension lines making breaks in the lines for the figure.
8. Place part dimensions nearest the object.
9. Place over-all dimensions outside of the part dimensions.
10. Put on the arrowheads and insert proper figures.
11. Proceed in the same manner giving width and height of all parts.
12. Check over the drawing to see if any more dimensions are needed.
13. See that the title and figure number are correct and plainly lettered.
14. *Caution:* Do not repeat any dimension unless there is a special reason for the repetition.
15. Attempt to reach the highest degree of perfection in the following phrases:
   a) Accuracy
   b) Neatness
   c) Good workmanship
   d) Speed
   e) Originality
   f) Care of tools and equipment

Junior-High-School Printing Classes

Frank Di Giacomo

David Boody Junior High School, Brooklyn, New York

A discussion of the various types of junior-high-school programs, with some suggestions as to possible improvements in the scheduling of classes in printing.

A discussion on scheduling printing classes would not be complete without first indicating the place of printing in our modern educational philosophy. Among the specific functions of the junior high school in which we are particularly interested are recognition of individual differences, exploration for guidance, and beginnings of a vocational education. Under exploration for guidance are classified such statements as: Opportunities to explore various fields to discover interests and abilities so that the pupils will have a basis for making a choice when the time comes for specialization. The exploratory printing courses in junior high schools allow the pupil to sample a number of activities related to the graphic arts, with a view to more intelligent choice of further occupational training and for cultural appreciation.

Some leaders in educational thought, and alert school administrators look upon junior-high-school printing as a branch of general education. They believe that printing at the junior level should be included

in the curriculum for the same reasons used to justify other instruction. Any school subject which provides opportunities for pupil self-discovery and which at the same time serves as a medium for educational development is self-justified. The study of printing offers many educational possibilities. Unfortunately, the maximum good which can be derived from a course in printing is often hampered either by improper scheduling of classes or by poorly organized courses of study. Probably every printing instructor has at some time or other experienced the results of poor class scheduling for the printshop.

Among the grievances of scheduling which may be mentioned are the doubling up of beginning classes, which causes an overcrowded condition in the shop; the two periods of shop per week, and the single-period shop sessions. It is generally conceded that these conditions make for poor education. The single-period shop sessions, unless they are one-hour periods, are generally a waste of time.

In the January, 1937, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, R. Randolph Karch reported on a survey he made during the school years 1932–33–34–35, regarding the effect of doubling printshop periods. Boys from various parochial schools in Pittsburgh were attending the industrial-arts classes at Arsenal Junior High School two separate forty-minute periods per week. The shop teachers were unanimous in the belief that the single forty-minute period plan was unsatisfactory in teaching shop subjects. They believed that if the shop time were doubled to eighty-minute periods, the pupil achievement would more than double. This reasoning was justified when one considers that at least ten minutes could be saved, five minutes for starting the work and five minutes for the clean-up, which could be used for instructional purposes. For two single periods the clean-up time would amount to twenty minutes, whereas for double periods it would be only ten minutes. By reason of the longer periods, the amount of work would be more than doubled. The average number of lines set during the first semester with one forty-minute period per week was 39.8. The average number of lines set during the second semester with a double shop period of eighty minutes was 153.8, or nearly four times as much.

In like manner, evidence could be produced to prove that other scheduling defects are not conducive to the best educational needs of boys. Several types of junior-high-school programs, which are typical in various sections of the country, follow.

Types of Junior-High-School Programs

A canvass of junior-high-school programs shows that they may be classified under four main forms:

1. The single-curriculum type.
2. The multiple-curriculum type.
3. The constants-with-variables type.
4. The combination type.

The single-curriculum type is provided in a small proportion of junior high schools composed of the seventh and eighth grades. In this program, all pupils take identical work, except that the boys are required to study industrial arts and the girls to take cooking and sewing. The offerings in this program are only slightly better designed to recognize individual differences and self-discovery than the most conservative elementary-school curriculum. In the seventh grade, the following industrial-arts subjects are made available in various schools: Applied science, electricity, woodwork, mechanical drawing, and metalwork. In the eighth grade are listed auto mechanics, electricity, machine shop, mechanical drawing, and printing. The most common scheduling in such a program is two periods of sixty minutes per week for one year.

The multiple-curriculum type of program provides two or more fully prescribed curriculums to be pursued by as many groups of pupils. The work of the seventh grades is identical to a large extent, but it is similarly distributed within groups in the ninth grade. In the eighth grade are set up the various types of curriculums, such as the academic, commercial, home economics, and industrial arts. These curriculums, after once being elected, are fully prescribed. The industrial-arts curriculum is provided for those who do not anticipate going to high school or taking a college-preparatory course, and for those who desire to begin the study of the fundamentals required of the various mechanical trades. This type of curriculum has advantages along the lines of the beginnings of vocational education and of recognizing individual differences which help to retain the pupils in school for a longer period. The danger lies in the failure to provide ample exploratory opportunities for all pupils, and in the assumption that a pupil's vocational group and specialization may be fixed during this period. This assumption may be true of some pupils, especially the over-aged, but the changing character of the occupational choices of young children and the impossibility of providing adequate exploration by the pupils brands this type of program as not fully appropriate. Many principals use this course as a dumping ground for misfits in the academic subjects without due regard for the pupils' needs. The usual rotation of shops for the industrial curriculum is ten weeks in each shop for five periods per week. The length of the elective shop in the ninth grade varies in different schools from five to ten periods per week. In some cases the boys have shop one period per day, and in other instances two periods per day. In the Junior High School, St. Cloud, Minn., there is a rotation of shops providing for ten 45-minute periods per week for six weeks, two periods per day in the eighth grade. The elective course runs for ten periods per week for eighteen weeks in the ninth grade.

The constants-with-variables type of program is in use in an increasing proportion of junior high schools. According to this program, certain subjects are prescribed for all pupils in each grade. A number of variable subjects are offered from which the pupil with guidance selects enough work to meet the requirements of the curriculum. This type allows a greater variety in the curriculum and enables the pupil to come in contact with a wider range of subjects. In the seventh grade, English, geography, social science, arithmetic, penmanship, and physical training are the constants. The pupils are allowed to elect four exploratory courses from three different fields which must be pursued for nine weeks. The constants decrease regularly from the seventh grade to the ninth grade, with a proportionate increase in the elective fields. The place of industrial arts in this type of program is shown in the shop schedule found in the junior high schools of Cleveland: four periods of shop per week in the seventh grade, six periods of shop in the eighth, and ten periods in the ninth grade. In a good-size city of the middlewest, the following schedule is observed: Two periods of fifty minutes per week for the seventh grade, the same for the eighth grade, five periods of fifty minutes for the ninth grade.

One type of program sometimes found in junior high schools may be designated as a combination of the multiple type with the constants-with-variables type. It provides for different curriculums such as general, commercial, and industrial arts, but also provides for electives. The pupil is allowed to choose five periods of work from a variety of additional subjects with provisions made for transfer from one curriculum to another. In this type of program, printing is scheduled in the eighth grade for five periods per week.

Another combination type is one which prescribes the work of the first and second years to be pursued by all and which en-

ables a pupil to choose from two or more curriculums in the third year. The shop schedule varies in different schools. In Detroit, boys in the seventh grade are given an average of four periods a week and in the eighth and ninth grades, an average of three periods per week. In the Washington, D. C., junior high schools, printing, metal crafts, and woodwork, in rotation, are prescribed for exploratory purposes in the 7A, 7B, and 8A, four periods per week. General science is prescribed in the 8B and a shop election of ten fifty-minute periods per week in the ninth grade.

Present Trends

In a recent survey, it was found that 58 per cent of the junior high schools prefer the combination type of program against 42 per cent showing a preference for the constants-with-variables type. The tendency is for industrial-arts subjects to enter the required groups in the seventh and eighth grades and become more frequently elective in the ninth grade. There is a growing tendency also to include more printing and less of the other shop courses.

Instructors are not all in agreement as to the scheduling they should like for printing classes. It has been suggested that ten fifty-minute periods per week for six weeks, or four fifty-minute periods for eighteen weeks is suitable for exploratory purposes. Both of these suggestions have been proved successful. Ample time is provided in both schedules for a short exploration in printing. A concentrated course of ten periods per week for six weeks has the advantage over the four periods, eighteen weeks, despite the difference of twelve additional hours for the latter. Daily contact with the materials of printing aids the retention and provides the continuity necessary for adequate exploration. The elective course would be given for ten fifty-minute periods per week in the ninth grade. It is generally agreed that two periods once a week are an educational waste. Several instructors have suggested that printing be taught only in the eighth grade as an exploratory course and that it become elective in the ninth. That also is a problem to be solved with the administrator of schedules.

It is a well-known fact that program making is now in the hands of either an academically trained principal or an academic teacher designated by the principal, both of whom may have little or no sympathy for industrial arts. Those in charge of programs still think in terms of the manual-training courses of three decades ago, and must be re-educated to the newer philosophy of the industrial arts, especially the graphic arts. Improvement of printshop schedules can be brought about only by impressing the principal and the academic teachers with the educational values offered by printing courses and by displaying real professional attitude toward the schoolwork and colleagues.

Proper attitudes may be created by setting up objectives and a course of study which offers boys the greatest amount of exploration, and which possesses at the same time maximum educational value in itself. Good results produced from an efficient job of teaching will do much toward selling printing to the principals and establishing for it a just place in the school program. Once the printshop is duly established in the curriculum, and a course is organized to serve the needs of boys, then we may expect printshop programming to be more reasonably done. Printing teachers also will find it to their advantage to be at hand when programs are being made. The personal appeal goes a long way, especially when diplomacy is used.

Problems and Projects

SUGAR BOWLS AND CREAMERS

H. M. Dexter, Central High School, Grand Rapids, Michigan

The sugar bowl and cream pitcher described herewith are shaped cylindrically, with a little flaring at the top and bottom, as shown in Figure 1.

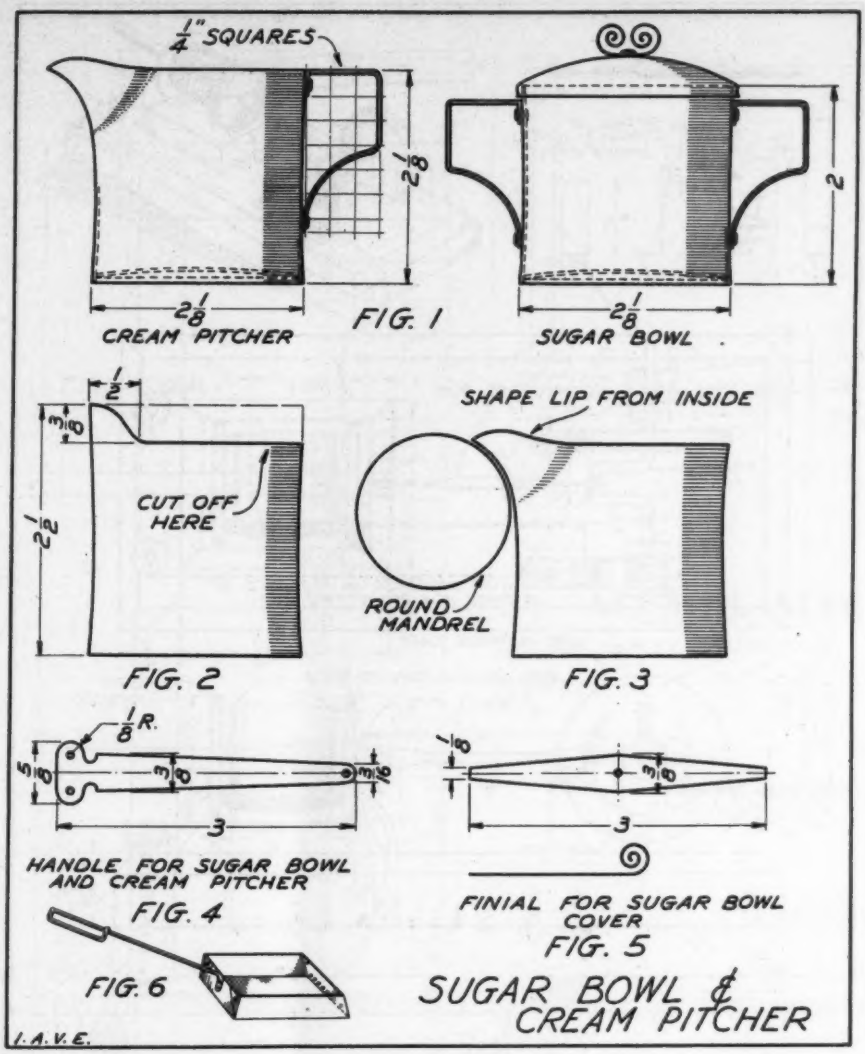
To make them, cut a 2½ by 6½-in. piece of 20-gauge for the pitcher, and one 2 by 6½-in. piece for the sugar bowl. Prepare these pieces for brazing by beveling both ends of each piece to sharp edges. These beveled edges must not be wider than 3/16 in. Next clean a space about ½ in. wide at both of the beveled edges by scrubbing with sand and water, or by rubbing with coarse steel wool, or by scraping with a sharp scraper. Do not use sandpaper for this purpose, because it often leaves traces of glue on the metal, and this will cause difficulties at the time of brazing.

After the metal is cleaned, roll the two pieces into cylinders, one 2½ and the other 2 in. high. Lap the beveled edges over each other and see that they fit tightly over the full length of the seam. This fitting should be done with the minimum use of a mallet. Do not use a hammer on the seam. Be careful that sweaty or greasy hands do not touch the seam or there will be trouble with the brazing of the joint.

For the brazing, spelter, borax, and water are used. Extreme cleanliness must be observed in the process of brazing, and there must be no lead, tin, solder, zinc, aluminum, rosin, or soap allowed to come near the joint that is to be brazed. For that reason the tongs used for holding the parts to be brazed must be inspected to make sure that none of these materials are adhering to the jaws. When all is ready for the brazing, rinse the cylinders in clean water, and then place a small amount of spelter along the edge of the seam on the inside of the cylinder, together with some borax mixed with water. Hold the cylinder with the pointed nosed tongs, seam downward, over a hot gas flame. If gas is not available, a coke or charcoal forge fire may be used. Heat the joint as fast as possible to the point where the spelter melts, otherwise the copper will badly oxidize and produce a poor seam. Continue to hold the brazed joint over the fire for a few seconds after the spelter has melted in order to give the copper time to get hot enough to alloy itself with the melted spelter. It is good practice to strike the article lightly with an iron poker in order to produce vibrations which will cause the melted spelter to flow and run through the lapped joint. Throwing a little pinch of borax on the nearly melted spelter also will prove to be of great help.

After the brazed article is removed from the fire, it should be quenched, that is, cooled off in water. It may then be examined to see whether the spelter has flowed evenly through the full length of the seam. At times the spelter rather stubbornly refuses to flow through some portions of the seam. The cause of this may be dirt, oil, grease, or insufficient flux. Frequently, too, failures in brazing are due to the fact that the metal in the joint has been exposed to the fire too long. If this is done, the metal becomes covered with a heavy coat of oxide which the flux is unable to clear off. The melted spelter, therefore, has no chance to reach and unite with the copper. If this has happened, it is best to open the bad spot on the outside, scrape it clean, hammer it together slightly, and with the article turned seam upward, deposit some spelter on the bad spot on the outside. Next, apply heat until the spelter melts and flows freely.

After a good joint has been made, the next thing is to finish it. Do not try to do this simply by hammering the joint. If this is done, the seam usually cracks open before the article is finished. If brazed seams are to be made so that they are not noticeable, they must be filed first, and then scraped. After the outside edge of the seam is completely removed, smooth off the file scratches with fine sandpaper. If the seam is then to be hammered, see that no burned borax is stick-



ing to the metal, otherwise a badly pitted surface will be produced. The seam cannot be hammered smooth in one operation as the hammering makes the spelter in the seam so hard that it may break. Therefore, after hammering for a short while, anneal the seam, cool it off and repeat the hammering. This annealing and hammering must be continued until the seam will no longer show on the finished article.

Before each annealing, the article should be washed in water. This must be done, because borax dust which may have become loosened by the hammer, if left on the metal during the annealing process, would melt and attach itself to the metal, thus causing more work.

Copper workers, while hammering brazed seams, frequently play a steady stream of water on the seam so as to wash away the borax particles as they are loosened by the hammers. In this way the borax is not hammered into the surface of the metal and a seam so finished is hardly perceivable.

After the seams on the cream pitcher and sugar bowl have been completed, anneal the two cylinders by heating them to a red heat, and then drop them into an acid pickle for about two minutes (be careful not to let the iron tongs dip into the pickle). Then remove them and soak them in a very strong solution of water and sodium chloride for fifteen minutes. Next, rinse well in clean cold water and scrub with sand and water until the metal shines. Rinse off well, and at once dry with sawdust. They are next planished either on a round mandrel of suitable size, or on a regular metalworker's blowhorn stake. Both pieces should be planished over their entire surface. As the ends of the cylinders are approached, the planishing blows should be made a little heavier so that the diameters here are increased a little. This eventually gives the straight-sided cylinders a slight curvature and makes them quite interesting. Be careful at all times, while planishing to keep these articles as round as possible. Next trim and file the ends until the cylinders stand level and vertical. The ends, when finished should be about 2⅛ in. in diameter. For the pitcher, choose the smaller of the two ends for the top, and proceed to form a pitcher's lip on this end. To do this, draw a pencil line ⅜ in. below the top edge, all around the object. Then draw a straight (vertical) line extending from the top to the bottom end, exactly opposite to the seam. Naturally, this vertical line will run through the other line which was drawn first. From the point where the two lines cross each other, measure ½ in. in each direction on the horizontal line. From the top of the vertical line, draw inclined lines to both of the points just located and then cut off the metal at the horizontal line, leaving intact the part provided for forming the pitcher lip. See Figure 2. Then file and sandpaper the top edge to perfect smoothness.

Next, rest the part of the prospective lip of the pitcher on a block of hardwood, and with a smooth end of the ball-peen hammer, raise the metal for the lip, working from the inside of the cylinder. The raising-out process must start at about ¾ in. inside of the protruding metal. The raising must be done with extreme care, otherwise the metal will break.

If the metal happens to break while working at it, braze or silver-solder the place before the damage has become too great. After the metal has been raised sufficiently to form the lip, a small round mandrel should be used as shown in Figure 3, to finish the curve of the lip as desired.

The next step is to make the bottoms for the sugar bowl and the cream pitcher. These bottoms are just round pieces of 18-gauge copper. They are shaped just a little concave as shown in Figure 1, and they must be made to fit tightly, about 1/16 in. above the bottom edge of the receptacle. Before soldering the bottoms in place, the concave bottoms and insides of the cylinders should be tinned. (See page 298, September, 1937, INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.) After the tinning is done, wash all parts thoroughly in rather warm water. If some of the tin has been spattered on the outside of the pitcher or the bowl, clean off these spots by scraping and sandpapering. Then press the bottoms in place and solder them properly.

For this soldering, use a fine string of high quality solder which is held in the inside while the article is heated on a gas flame. Do not try to do this type of work with a soldering copper.

Fine strings of solder may be prepared by melting a bar of solder in an iron ladle, being careful not to overheat the solder. If it is desired to make the solder finer, some pure tin may be added. Next, pour the melted solder into the square pan shown in Figure 6. This pan is made of 24-gauge black sheet iron. It has folded corners and measures 3 by 3 by ½ in. The iron handle is about 12 in. long. Near the bottom of the front edge, five or six ⅛-in. holes are punched. The pan is set on a sheet of black iron which may be laid on the workbench. Then when the melted solder is poured into the pan, the handle is raised and the pan is pulled slowly backward. When the edge of the iron sheet is reached, start over again, producing more round strings of solder. If the pan is pulled slowly, thicker strings are produced. By drawing the pan back rapidly, strings as fine as 1/64 in. may be obtained.

The next thing is to make the handles. The pitcher must have one, and the sugar bowl two of these. They may be made of 16- or 18-gauge copper. Lay them out according to the dimensions given in Figure 4.

After the handles are filed to shape, smooth all edges and then form the pieces as shown in Figure 1. Small holes are then bored at the right places for riveting. Use fine copper tacks cut to the right length for rivets. The handles on the sugar bowl are placed about ¼ in. below the top edge, to give space for the rim of the cover. Before the handles are riveted in place, the two projects should be thoroughly polished. Then the handles should be riveted on, after which the rivet heads should be soldered over on the inside of the receptacles. To do this, apply a bit of soldering flux to the heads. Then while holding the desired spot over a small hot gas flame, touch each rivet head with a very fine string of solder. This not only tins the rivet heads, but also makes the cream pitcher leakproof.

Wash both of the articles just finished in warm water to make sure there is not a trace of soldering flux left on them. Then dry them perfectly, and polish them once more on a buffing wheel, after which apply a coat of clear metal lacquer to the outside.

A cover is then made to fit loosely on the sugar bowl. This is made of 22-gauge copper. It also must be tinned on the inside. The finial, which is attached to the cover with a copper tack is made of 22-gauge copper, cut to the shape shown in Figure 5. After it is cut to shape, the edges are filed and finished very smooth. The rivet hole is then bored, after which it is polished on both sides and riveted to the center of the cover. Then the ends are curled up as shown in Figure 1, using very pointed round-nose pliers for the purpose. The cover and finial also must be lacquered.

ELECTRIC ENGINE

A. F. Starkey, Junior-Senior High School, South Milwaukee, Wisconsin

The electric engine described herewith demonstrates the principle of the solenoid very well. It was specially designed as a project for an eighth-grade electrical class, at a summer session of the Bradley Polytechnic Institute, Peoria, Ill., under the guidance of Fred. E. Dace, Professor of Electricity.

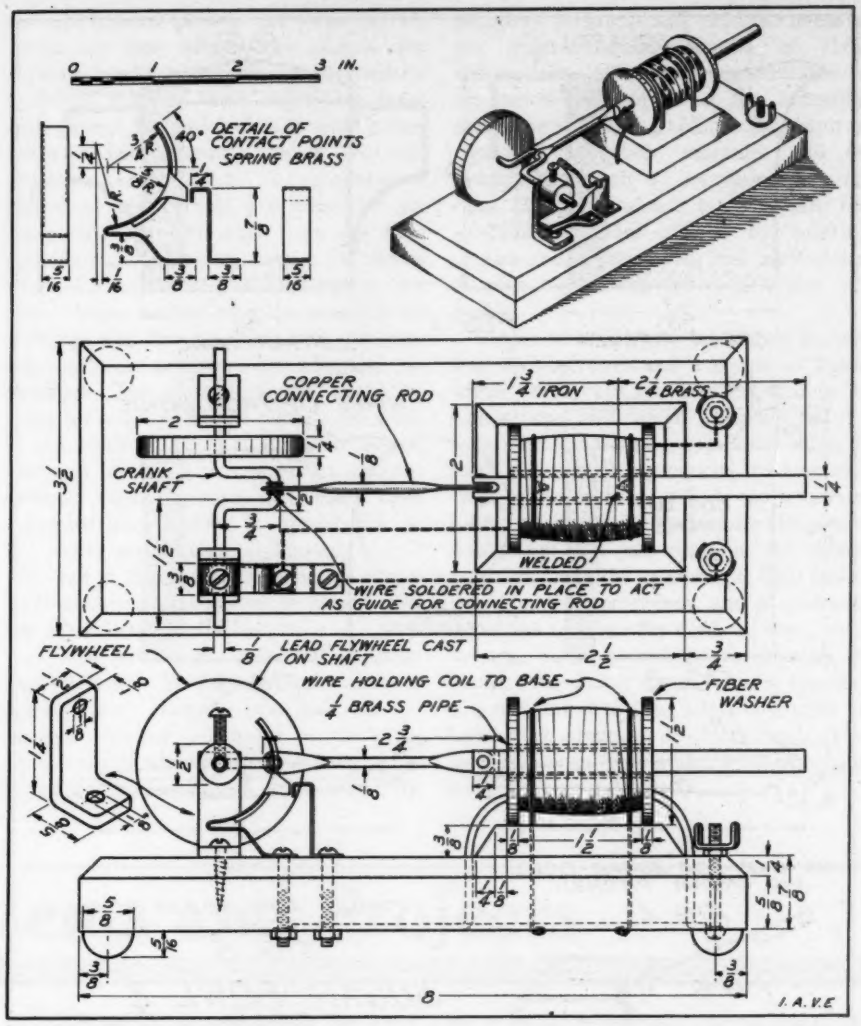
Materials Needed

1 wood base and coil base
1 lead flywheel, 2 by ¼ in.
1 ⅛ by 8-in. copper wire
1 ¼ by 1¾-in. iron rod
1 ¼ by 2¼-in. brass rod
2 1½ by ⅛-in. fiber or cardboard washers
1 ¼ by 1¾-in. brass pipe or fiber tubing
5 layers No. 18 bell wire
1 ⅛ by ½ by 4-in. strap iron
2 ⅛ by 1¼-in. r.h. stove bolts
2 ⅛ by 1-in. r.h. stove bolts
4 rubber-headed tacks
1 1/32 or 1/64-in. spring brass contact strip
1 contact setscrew and iron collar
2 No. 6 by ¾-in. r.h.b. screws

Directions:

1. Select stock for base and work to size:
   a) Plane bevel on edges.
   b) Arrange and glue coil mounting block in place.
   c) Drill holes for terminal posts.
2. Fit fiber or cardboard washers to ¼-in. brass pipe in form of spool:
   a) See that washers fit snug.
   b) Insulate brass pipe with layer of paper.
   c) Drill holes in each washer for wire to pass into base.
3. Place one end of wire through one hole in washer and wind as evenly as possible:
   a) Five layers of wire on spool.
   b) As you finish, extend other end of wire through hole in opposite end from one you started.
4. Iron rod and brass rod (welded in metal shop):
   a) Cut and fit to size of coil.
   b) Place coil on base 1 in. from end of base.
   c) Fasten coil with wire or tin covering.
5. Make or find a form for flywheel size, and pour melted lead for flywheel:
   a) Bend copper wire into shape of shaft.
   b) Bend to shape shaft supports and drill holes for wire to ride as bearing.
   c) Solder flywheel to shaft.
   d) Make the ½ by ⅜-in. iron shaft collar, and drill and tap for ⅛-in. contact set.
6. Cut contact points with tin snips and bend to shape.
7. Cut slot ¼ in. deep in iron rod and drill hole for pin to fasten flattened end of ⅛-in. copper connecting rod.
8. Cut slots for wire to run under base and attach contacts with terminals.

This engine is run on 6 to 12-volt current.

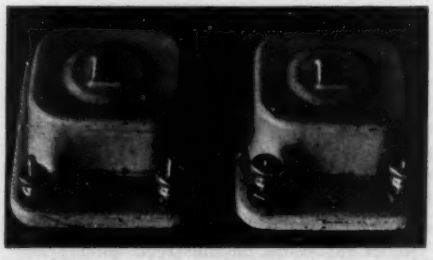


Electric engine

LONGER LIFE FOR BUZZERS AND BELLS

Frank D. Rohmer, Vocational Director, Lincoln High School, Midland, Pennsylvania

Bells and buzzers used in the school shop are standard for the trade and are usually



installed in the job permanently. The binding screws on these electric appliances are just long enough to permit the insertion of the

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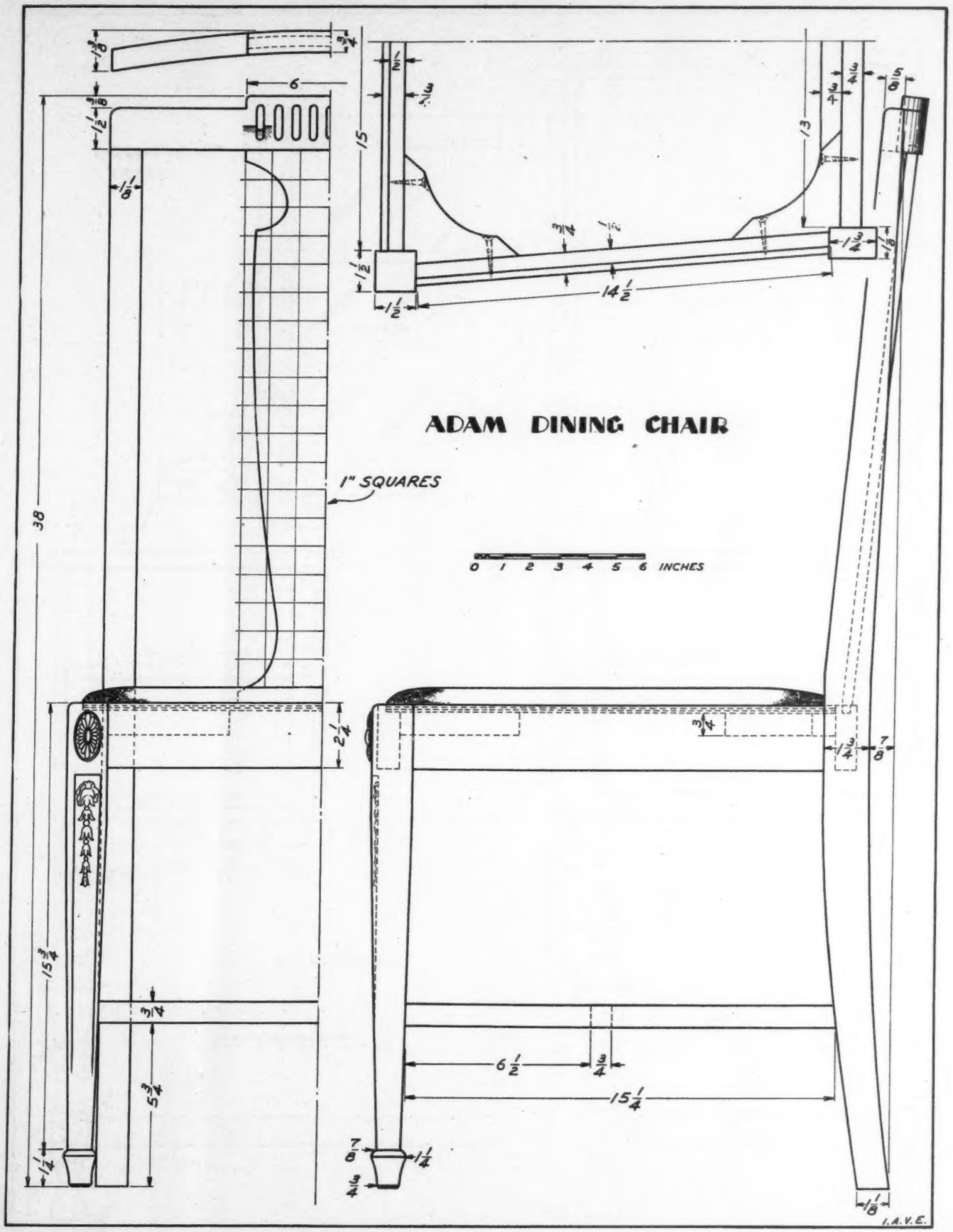
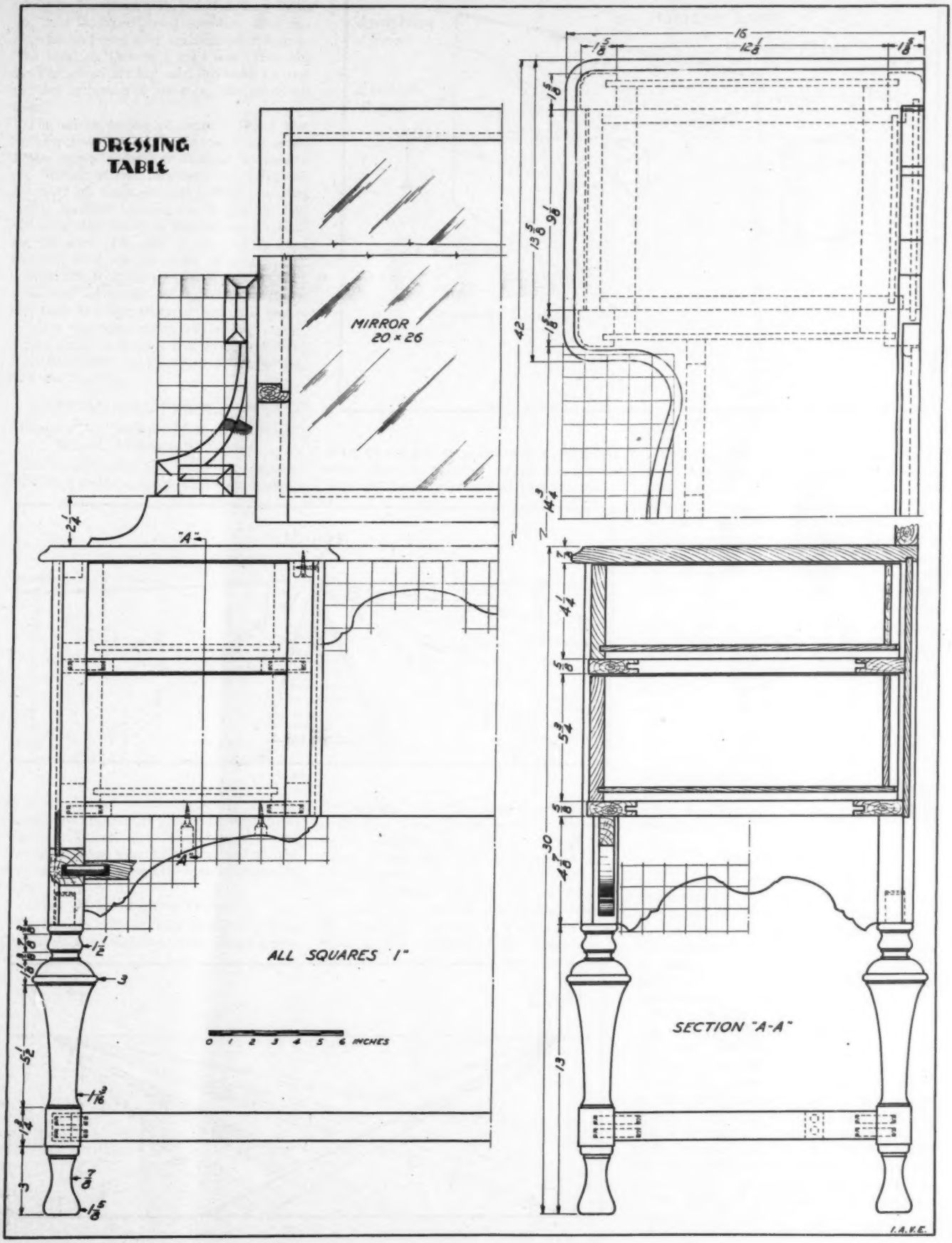


Designed by James Chadek, Vocational School, Appleton, Wisconsin



Designed by James Chadek, Vocational Schoo', Sheboygan, Wisconsin

(Continued from page 338)

wires. In the school shop, however, these items are used in experimental exercises, then dismantled and used over again in other lessons. The result is that in a very short time the binding screws are lost, and this tends to send the bell or buzzer to the scrap pile much too soon.

The accompanying photograph shows how we overcome this trouble. As soon as we get a new supply of bells or buzzers, we remove the binding screws furnished and substitute No. 6–32 r.h. brass machine screws, 1 in. long with a standard hexagon nut to lock the bolt and a standard No. 6–32 knurled nut for binding purposes. The end of the bolt is then flattened in a vise in order to prevent the knurled nut from unscrewing.

Another advantage is that with a longer bolt there is ample room for awkward fingers to place the wires under the binding screws.

This small added cost is a good investment as it has added several years of life to our bells and buzzers.

MECHANICAL PERSPECTIVE

Howard C. Nelson, Monmouth High School, Monmouth, Illinois

Mechanical-perspective drawing appears difficult to many students. This type of drawing is not difficult to make, however, and becomes quite apparent if the fundamental principles are known. It is important that the draftsman knows what he is doing and why he is doing it when using this form of representation.

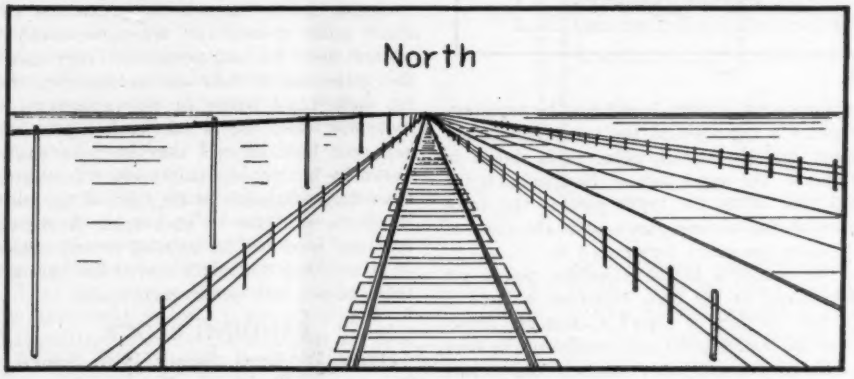


Fig. 1

The Vanishing Point

The straight railroad track on a level prairie (Fig. 1) is a familiar illustration which represents a principle of perspective drawing. Assume that the observer stands between the rails and looks northward in the direction of the receding track. The rails appear to converge at a point directly north of him. The fences, telephone line, and paved road also appear to converge at the same point, a point directly north of the observer. The fences and roads are actually parallel and are directed in a northerly direction, but on the drawing they appear to converge at a vanishing point which is directly north of the observer.

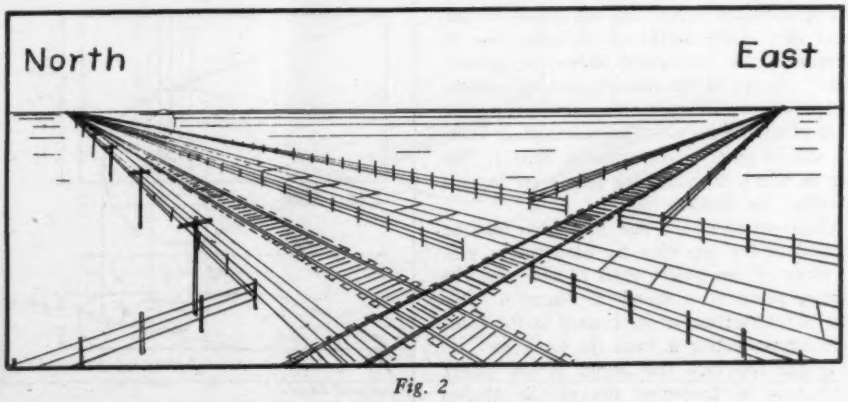


Fig. 2

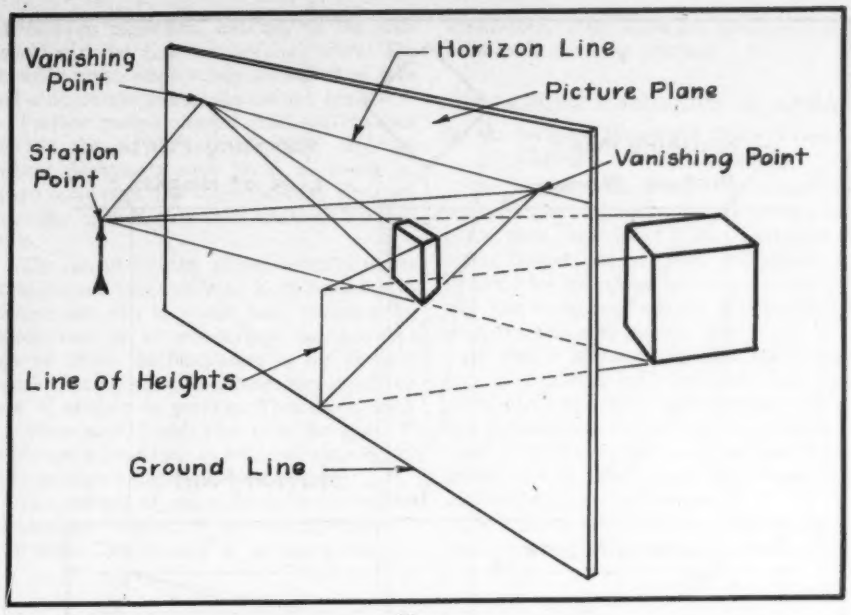


Fig. 3

Suppose, now, that a track and fences, which had been built in an easterly direction from the same point, were viewed by an observer who was looking eastward. It would be found that these fences and rails would appear to converge at a vanishing point which is directly east of the observer. The vanishing point for lines which are directed eastward is found to be at a point east of the observer.

If both of these tracks (Fig. 2) were now viewed by one who was looking in a northeasterly direction, the lines to the north would continue to appear to vanish at a point north of the observer, while the lines to the east would still vanish at a point to the east of him. The position of the observer is called the station point.

From these facts and similar additional facts, if the investigation be continued, the following rule may be deduced:

Rule 1. The vanishing point for any straight line is in a direction parallel to that line, from the station point.

The Picture Plane

If a piece of glass were placed between a person's eye and an object, it would be possible to obtain a picture of that object by tracing the lines of the object upon the glass. This procedure is similar to what is done in mechanical perspective, for the picture is drawn on the picture plane which may be represented by a glass as is shown in Figure 3.

Notice in Figure 3 that the rays of light pass from the object toward the eye (or station point) until they reach the picture plane or glass where the picture is formed. This principle may be made more clear by experimenting with a glass, a small object, and a crayon. If the object be viewed with only one eye, a perspective drawing may be rather easily sketched upon the glass. In this drawing, the end of the arrowhead indicates the position of the eye or the station point.

This procedure of drawing is explained as follows:

Rule 2. All points and lines of an object

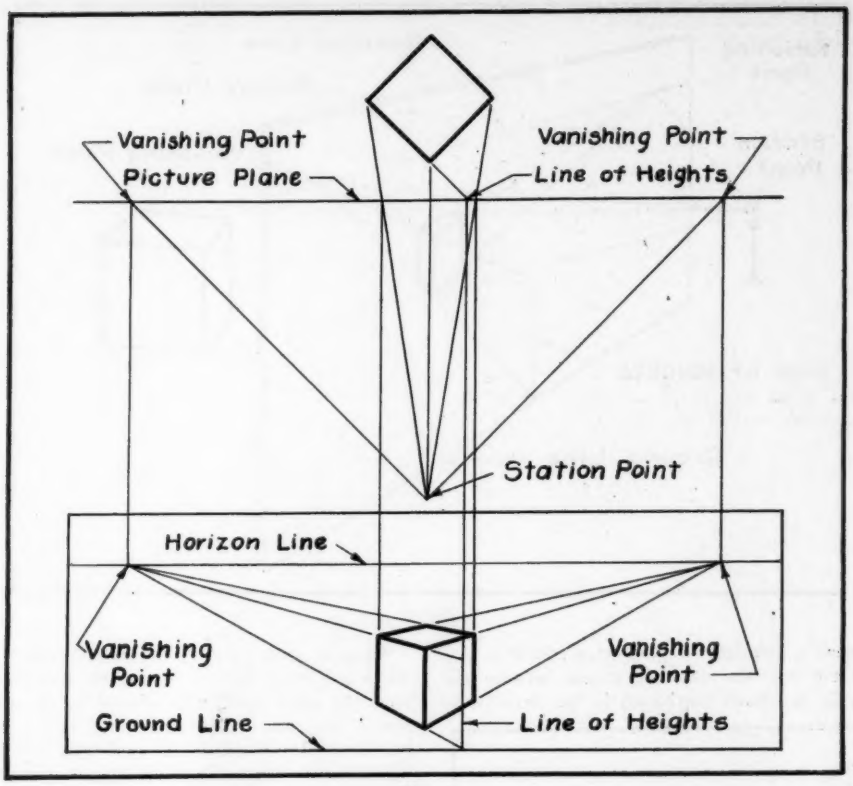


Fig. 4

should be projected toward the station point until they intersect the picture plane where they form a perspective drawing of the object.

Observe in Figure 3 that the positions of the vanishing points have been determined according to Rule 1, for they are in directions parallel to the sides of the cube, from the station point.

The Line of Heights

If an edge of the cube were placed against the glass or picture plane and a picture traced on the glass, the edge of the cube would be shown in its full size on the picture; the line of the picture would be the same length as the edge it represented. An edge of the cube does not coincide with the picture plane, however, and it is therefore necessary to project it forward until it intersects this plane. It is then possible to measure the actual height of the cube on the picture plane where the projected edge coincides with the picture plane. This line of intersection between a plane of the object and the picture plane is called the line of heights. It is often advisable to have several lines of height, but only one is used in this drawing. All heights are measured from the ground line and upon the line of heights. The ground line is formed by the intersection of the picture plane with the horizontal plane or the ground.

Rule 3. All measurements of height are made upon the line of heights which is formed by the intersection of a plane of the object with the picture plane.

Making a Mechanical-Perspective Drawing

Let us now consider the application of these principles and rules in drawing a mechanical perspective of a cube. It will first be necessary to draw a top view of the cube, the picture plane, and the station point as is shown in Figure 4. The upper part of the drawing is the top view while the lower part is the front view of the picture plane, with the lines of the cube projected forward to it.

The positions of the vanishing points are determined as has been explained in Rule 1. In the top view of Figure 4, lines are drawn from the station point and parallel to the sides of the object until they intersect the picture plane, for the vanishing point for any straight line is in a direction parallel to that line, from the station point. The picture is to be drawn on the picture plane, hence the vanishing points must lie on the picture plane. Therefore, the points at which the lines from the station point intersect the picture plane are the locations of the vanishing points.

The positions of the vanishing points have been determined in the top view. To locate them in the front view, simply project them orthographically from the top view to the front view. Their height on the front view is determined by the height above the ground line of the eye of the observer, for the vanishing points are in a direction parallel to the sides of the cube (which are horizontal) from the station point as explained in Rule 1. The line on which the vanishing points are located is called the horizon line.

The position of the line of heights may be located in the top view by extending a side or plane of the object until it intersects the picture plane as is shown in Figure 4. This line of intersection is determined in the front view by projecting it from the top view.

In the top view the points of the object may now be projected toward the station point until they intersect the picture plane as was explained in Rule 2. These points of intersection may then be projected to the front view of the glass or picture plane.

In the front view, the height of the cube is measured on the line of heights and from the ground line. This principle was explained in Rule 3.

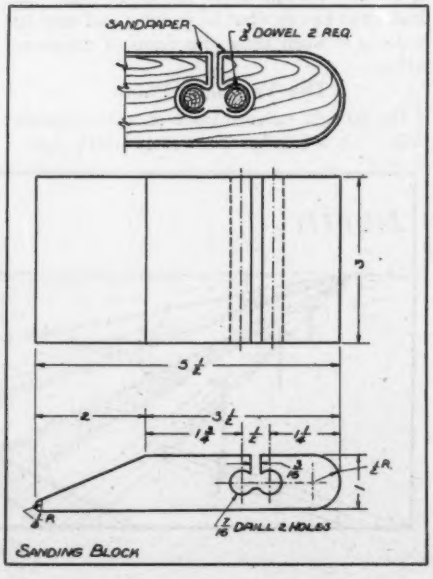
Notice in the top view of Figure 4 that the line from the line of heights to the cube slants to the left. In the front view, therefore, the points are projected from the line of heights toward the left vanishing point. The intersection of the projections of the points from the line of heights with their projections from the top view of the picture plane determines the locations of the points in the perspective drawing. If lines slant toward the left in the top view, they are to be drawn toward the left vanishing point in the front view; if they slant toward the right in the top view, they are to be drawn toward the right vanishing point in the front view. By following this procedure, all of the points and lines may be determined in the front view or perspective drawing.

All vertical lines are drawn vertical in a perspective drawing, for vanishing points cannot be determined for lines which are parallel to the picture plane. Horizontal lines for which vanishing points have been determined are quite easily drawn, for they are extended toward their vanishing points until they reach the projection of their end points from the top view. Lines which are not horizontal, or horizontal lines for which vanishing points have not been located, may be most easily drawn by locating the points which terminate those lines; diagonals of the faces of the cube would be examples of such lines. A curved line may be drawn by locating several points on it and then drawing a curved line through those points with an irregular curve.

SANDING BLOCK

Harry W. Kroll, Senior High School, Rockford, Illinois

The sanding block described herewith is very useful in the school shop since it provides several desirable sanding curves and sur-



faces, encourages the economical use of sandpaper, and provides an excellent method for holding the paper in place. It may also serve as a test block for woodworking classes.

Purchasing sandpaper in the roll has been found to be most economical as all of the paper can be used on this block for actual sanding.

To find the length of the sandpaper required, cut a piece of scrap paper and test for exact length. The dowels must be rounded at one end and the sandpaper should be rolled around them to shape the paper. Slip one end of the paper in first, push the dowel in place, draw the paper around tightly, and push the other dowel in place. After a little practice, the paper and dowels can be fitted in place very quickly.

LEARNING TO READ THE MACHINIST'S SCALE

E. W. Ross, Instructor Vocational Training, Hollister High School, Glouster, Ohio

Perhaps the most difficult job the vocational instructor has is developing the student's ability to measure things correctly, and much of his time is taken up correcting or verifying lengths, widths, and other dimensions in a constant effort to maintain the standards of his shop.

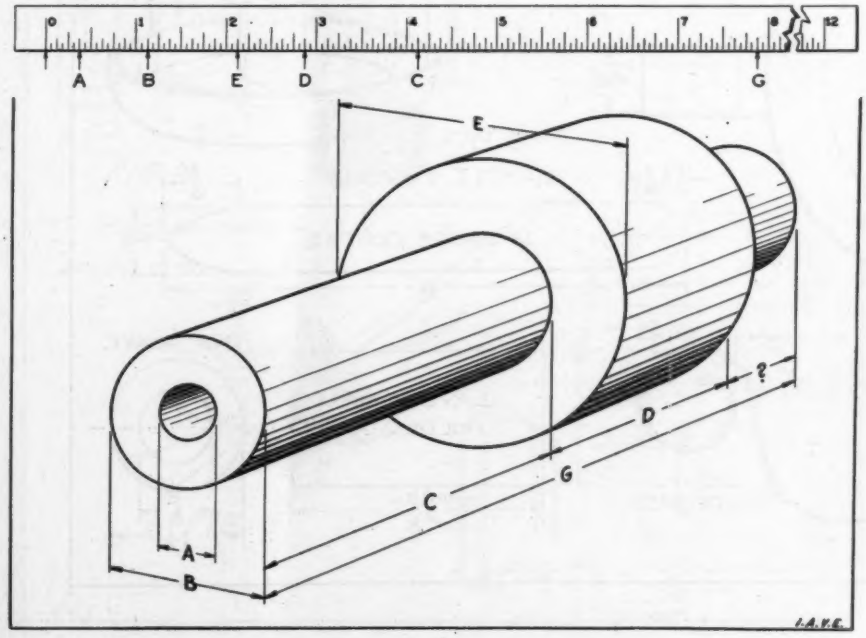
Inasmuch as the ability to measure, or obtain correct measurements, is a basic requirement of many trades and vocations, permitting a student to enter industrial life without developing it handicaps the boy with a burden not easily removed. The machine shop, the garage, the sheet-metal shop, the plumbing shop, the building trades; all demand accurate measurements and will tolerate no mechanic whose measurements are doubtful. Yet these are the trades vocational students will enter.

Long and careful observation proved that the poor workmanship was not due to lack of manipulative skill, for given calipers *set* to a determined dimension, *any* boy in the class could and did turn out accurate work. The trouble began when a boy attempted to take off a dimension and set the calipers himself.

Further testing showed that the students lacked the ability to work from drawings where dimensions were given in inches or parts of an inch. The whole difficulty was their inability to read a common machinist scale or rule.

The trouble located, proper remedial measures seemed fairly obvious. A reproduction of a machinist rule to a scale large enough to be easily read by all members of the class was placed above the blackboard in the drafting room. The lines for the graduations should be cut in as deep as possible. Then dip a cloth in white enamel and wipe over the lines. It will look a bit messy at first, but cleaning up will produce a startlingly clear outline.

The method of using the scale in reading dimensions is shown in the accompanying illustration. This method is, of course, equally applicable to other shops and furnishes a good solution to a vexing problem.



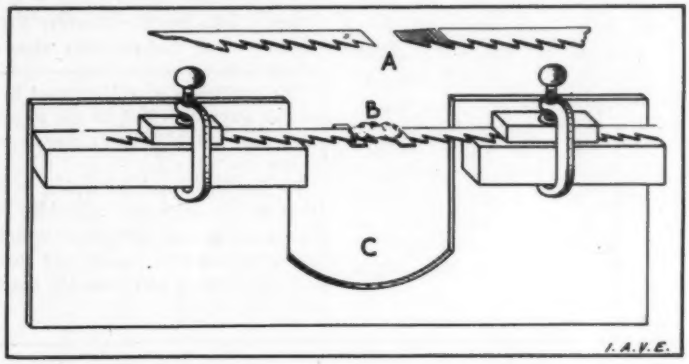
BRAZING BAND-SAW BLADES

R. H. Jenkins, Humboldt State Teachers College, Arcata, California

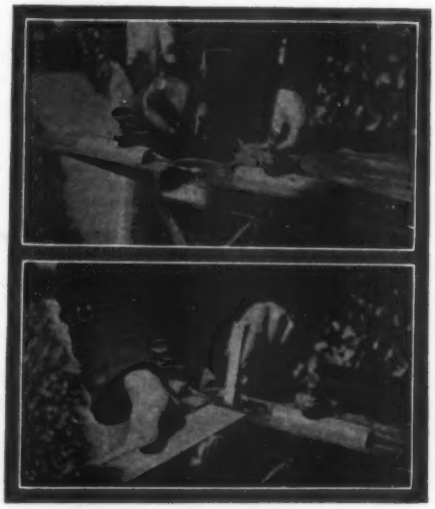
The brazing of a band-saw blade sometimes becomes quite a problem to the teacher in a small shop, especially if his equipment is rather limited, and yet time and money can be saved for his school by doing the job himself. The work, too, need not be a problem at all if the following method is used.

All that is necessary for the task is some type of clamp to hold the blade, two small pieces of silver solder, some powdered borax flux, a gasoline torch, and two small pieces of wood. If no brazing clamps are at hand, a substitute can be made from hard wood with small hand screws for clamps.

The silver solder should be a good grade of hard flowing solder which can be ordered from



An improvised clamp made of wood. A shows the blade clamped in place with the borax and solder ready for the torch. The space C must be great enough to avoid burning the wood with the torch. The board itself may be clamped into any convenient vise



Top. Applying the heat to the blade. Bottom. Pressing the soldered joint together

any jewelry supply house. Fifty cents worth should last for many months. The torch may be any make which will throw a good hot flame, and for borax any ordinary powdered brand will do. The two small pieces of wood may be taken from the scrap heap.

File the two edges of the blade on a bevel or slant, cutting back about two teeth so as to give a strong lap to the work. Place the blade in the clamp with the edges of the saw lined up perfectly, and the two filed surfaces nicely overlapping. Bend the blade in such a manner that the lap fits closely together. Place some powdered borax between the two surfaces, and strips of silver solder under each edge. On top of the joint, place some more borax. Begin heating the joint very gently with the torch so as not to blow the flux away before it has melted. When the flux has once fused, turn the full force of the heat to play upon the blade. In a few seconds the solder will melt and flow evenly. Place a small piece of board under the joint and press down from the top with another piece. Take the torch away and hold the position for a few seconds. The joint should be found well brazed. While still hot, temper to the desired hardness with a little machine oil. File the work smooth and the saw is again ready for use.

The writer has brazed saw blades by this method with very few failures. This method does away with the inconvenience of using a pair of tongs, and it is much faster. In timing the process, three saws have been brazed in fifteen minutes. The sticks are used in place of pliers or tongs because the cold metal tempers the saw too hard.

COPPER CANDLESTICKS

Leon H. Baxter, Association for Crippled and Disabled, Cleveland, Ohio

(Continued from page 307, September issue)

Cape Cod Type Candlestick

The candlestick illustrated in Plate 21 has the curved sides of the saucer convex, and the drip pan, after being cut out and planished, is cupped over so that the outer edge is lower then the inner. This is done by taking a sandbag, or a block of lead cast about ½ in. thick, and pounding the pan on it with the rounded end of the hammer until a uniform cupped out depression is obtained. A lead block will be found useful many times for this kind of work, and is easily made. Four sticks of ½-in. wood cut and nailed to a flat board will make a form into which hot lead is poured. After the lead cools, remove the wood frame and hammer a depression in the casting with a round ended hammer. A stout bag filled with fine sand will also give a similar result, but is not so lasting.

The saucer is formed from a circular disk or 18-gauge soft copper about 6 to 6½ in. in diameter. This size is sufficiently large to form a saucer whose final diameter when completed will be 5 in.

The candleholder *A* is formed by either of the two ways described for the colonial candlestick (pp. 304–307, September issue), but it is only 1½ in. tall.

The handle is made of a piece of ⅝ by 6-in. 14-gauge copper, with the ends curved as shown. Locate and drill the rivet holes in both handle and saucer, taking care that they are properly located and coincide exactly.

After planishing the material for the handle, anneal to soften, and bend around a piece of pipe about 1 in. in diameter.

Take special pains to form the handle curve gracefully and of proper size. Rivet the handle to the saucer as previously described.

Solder the drip cup to the candle holder and then to the center of the saucer as described under "Soldering," page 305, September issue.

Clean thoroughly with fine steel wool and allow to oxidize in the air or fume as described under "Finishing," page 306, September issue.

FORD MAGNETO D.C. MOTOR

Byron M. Taylor, Woodrow Wilson Junior High School, San Diego, California

The permanent magnets which were used in the magneto of the Model T Ford automobile are still easily obtained, and may be purchased for a very small sum at automobile wrecking yards or similar places. An experimental type of direct-current electric motor with this magnet as a basic element is easily made. Small variations in dimensions between these magnets may be found but no difficulty will arise from this as no critical measurements are involved.

To make the base (Fig. 2), place the magnet on a board ¾ in. thick, with the grain disposed as shown. Mark on the wood the exterior outline of the magnet. Extend this outline ½ in. at the wide end to conform with the dimensions given. Cut out the base along the lines and form the depression in the forward part as indicated, and drill the two ⅛-in.

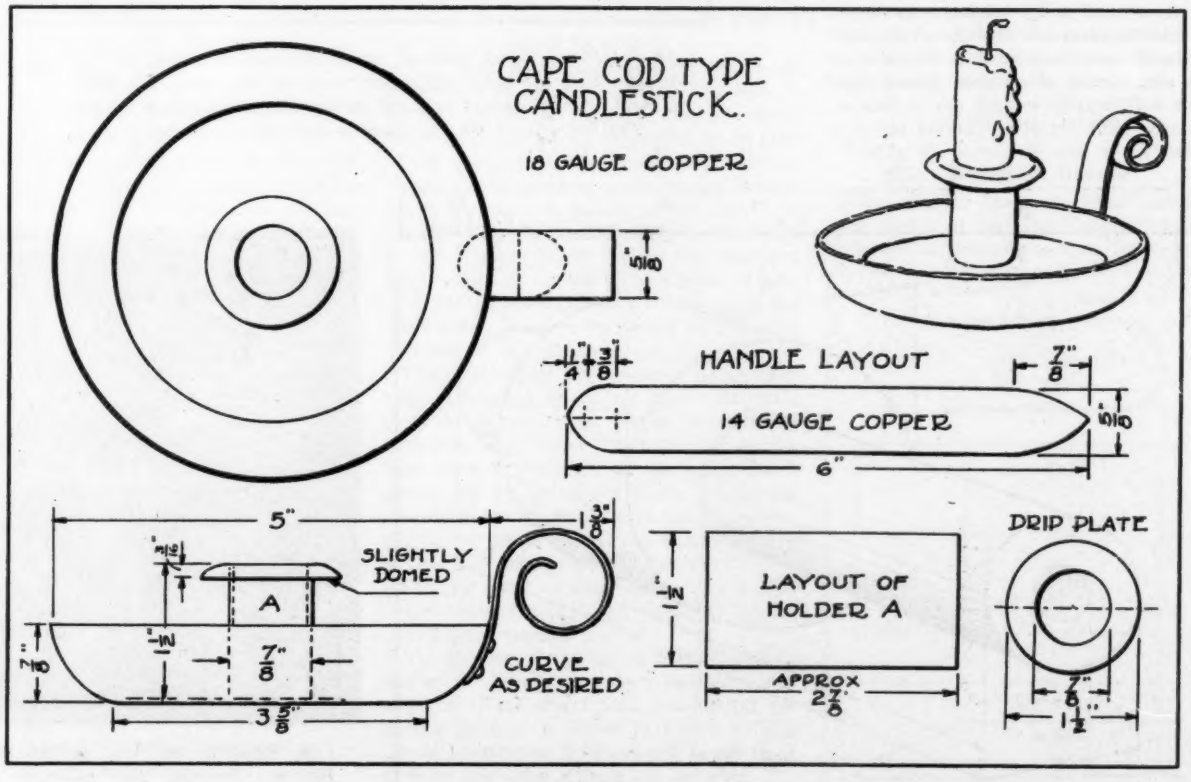


Plate 2

holes as indicated. Countersink these holes on the underside of the base for No. 6–32 nuts. Smooth up the edges and surfaces.

The clamp (before bending) is shown at *b* in Figure 3. It is cut out of 18-gauge hard-drawn sheet brass. Drill the two screw holes and then bend the wide tongue at right angles to the crosspiece. The piece turned down is the rear shaft bearing. Drill a 5/32-in. hole centrally and ⅜ in. below the underside of the crosspiece. Finish the hole to 3/16 in. in diameter by "burring" it out with a pointed piece of 3/16-in. drill rod used as a drill. A more lasting bearing surface is formed in the brass in this way. Insert two No. 6–32 by 1¼-in. r.h. brass machine screws in the screw holes. Place the magnet on the base as shown in Figure 1 with the rougher side next to the wood. Pass the screws with the clamp attached through the holes in the base and fasten in place with the nuts.

The armature shaft is a piece of 3/16 by 7-in. drill rod. The armature core is cut with a hack saw from a piece of ½ by ¾-in. flat bar iron. Shape the piece as shown in Figure 4. The hole to be drilled for the shaft is 3/16 in. in diameter. When it is drilled, push the shaft through the hole leaving 3⅜ in. of the shaft projecting from the narrower end of the core. To secure the shaft in this position, place the assembly on an anvil with the core flat on the anvil. Place the point of a center punch on the core above the location of the shaft and strike the punch a sharp blow with the hammer. Do this twice on each side of the core. Figure 4 shows two of the punch marks. As the core revolves between the legs of the magnet, a slight rounding must be given to the core faces so that they may clear the magnet. This work can be done with sufficient accuracy by filing. Bring the longer end of the shaft to a blunt point as in Figure 5.

To prepare the core for the winding, have at hand some friction tape and two strips of thin sheet steel 11/16 by 2¼ in. Place the steel pieces against the core as shown in Figure 5, and then cover them and the core (except the faces) with friction tape. Extend this covering to a small part of the shaft where the wire will rest against it. See Figure 5. Finally, lay another piece of friction tape, ¾ by 2½ in., on each steel strip.

The winding consists of 75 to 100 ft. of No. 26 s.c.e. or d.c.c. magnet wire. Lay one end of the wire next to the shaft (Fig. 5), leaving a lead of about 2 in., and wind on the wire neatly. As the first layer of wire approaches completion, turn up the ends of the steel strips (as shown in Fig. 5) to prevent slipping. Wind back and forth to a depth of about 6 layers and then cross to the other side of the shaft winding (in the same direction) the same amount of wire on the other side of the core. Arrange to finish the winding at the shaft and leave a lead as before. This lead may be hitched under the last turn. Press the four ends of the steel strips inward so as to confine the turns of wire, as shown in Figure 6. Treat the coil with a coat of lacquer.

The commutator is made from a piece of ⅛-in. (iron pipe size) brass pipe 1¼ in. long. With a hack saw, divide it into two equal parts lengthwise as shown at *a* in Figure 6. Tear a 4½-in. piece of ¾-in. friction tape in half lengthwise. Wrap the halves around the shaft tightly, and build up a bushing equal in diameter to the inside of the pipe. See Figure 6. The purpose is to form two bushings with the friction tape, which will support the two pieces of pipe, the latter being held in place by a piece of twine, tightly about the center of the pipe. Before the pipe sections are bound in place, the leads from the armature coil must be arranged on the friction-tape bushings so that one lead will be in contact with each half pipe section. The electrical connection between the leads and the sections must be good, and the sections of pipe must not touch each other. Before tightening up with the twine, have the gap between the sections in line with the core faces.

The forward bearing of the armature is shown at *a* in Figure 3. It is cut out of 18-gauge hard-drawn sheet brass. Drill the holes and form the bearing hole as before. Before attaching the bearing to the base, put a fiber washer about 1 in. in diameter on the forward end of the shaft. Next to that put a No. 8 brass washer. With the armature in place, put the bearing on the shaft and (with the bearing against the end of the base) mark on the wood the positions for the wood screws. This will be determined to some extent by observing in what position of the bearing the armature is best placed between the magnet poles. Set up the bearing with two No. 6 by 1¼-in. blue wood screws.

Form the two brushes (one of which is shown in Fig. 7) from pieces of No. 16 gauge bare copper wire 8 in. long. Bend the wire at the center and bring the ends together. Take a half turn of the ends of the doubled piece around some cylindrical object (such as the handle of a screw driver) about 1 in. in diameter. Having approximated the shape shown in Figure 7, attach the brushes to the

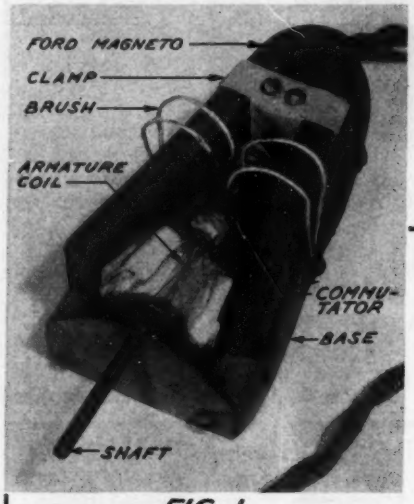
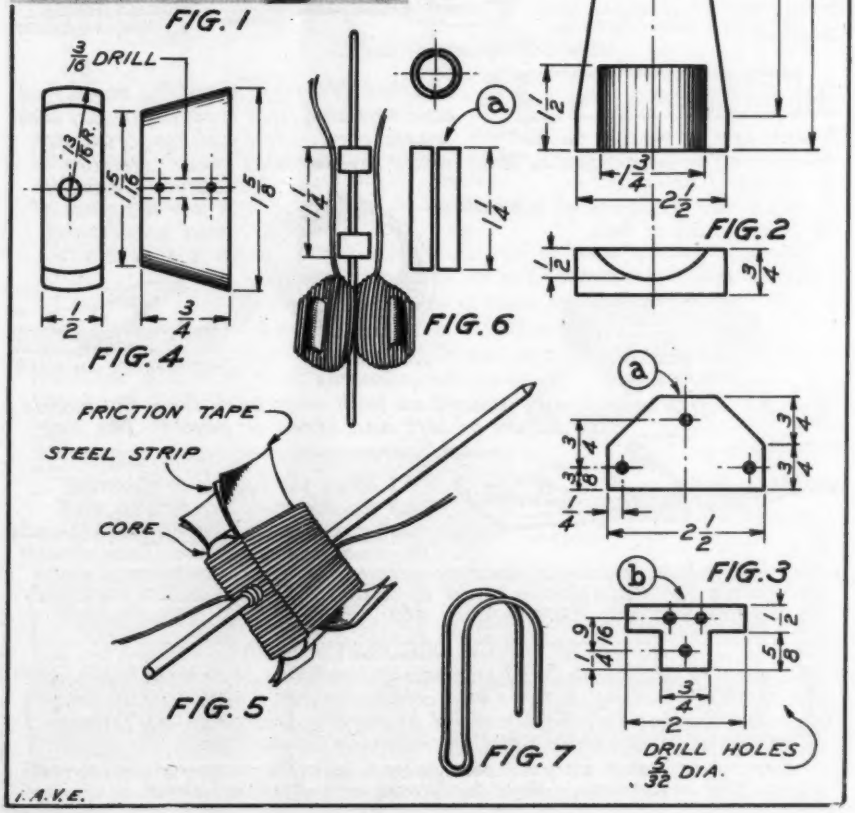


FIG. 1



base with No. 6 by ½-in. blue wood screws each having a No. 6 brass washer under the head. See Figure 1. The brushes should rub lightly on the commutator as it revolves and be vertical where they touch it.

Under the washers carried on the blued wood screws, attach the ends of 3 or 4 ft. of lamp cord and then fix the cord to the base with insulated staples. One of these is seen on Figure 1. Finish the work by lacquering the various parts in contrasting colors using the base color as a background.

This is a 6- to 8-volt direct-current motor and the source of energy will be, in most cases, a storage battery or dry cells. Oil the bearings and see that the armature turns freely.

SANDPAPER BLOCKS

Alfred M. Andersen, Roosevelt Junior High School, New Britain, Connecticut

Anyone working in wood realizes the importance of using good smooth blocks when sandpapering surfaces. These blocks, if saved, can be used over and over again.

However, in most junior-high-school shops, the industrial-arts instructor has to replace blocks quite often because of lack of proper identification, as it frequently happens that the boys will use them for something else or the blocks become mixed with scrap wood.

To help identify them, we cut them to size and then give them a coat of black enamel. It takes sixteen blocks to spell out *sandpaper blocks* with an extra block for space between the two words. The letters are painted in white or gray on the upper side of the blocks as shown in Figure 1. Screw eyes are then put into one end of each block, and the blocks are hung in some conspicuous place, preferably near the tool cabinet where they are easily accessible.

This idea has been in use for four years without the loss of a single block.

SAFETY RULES

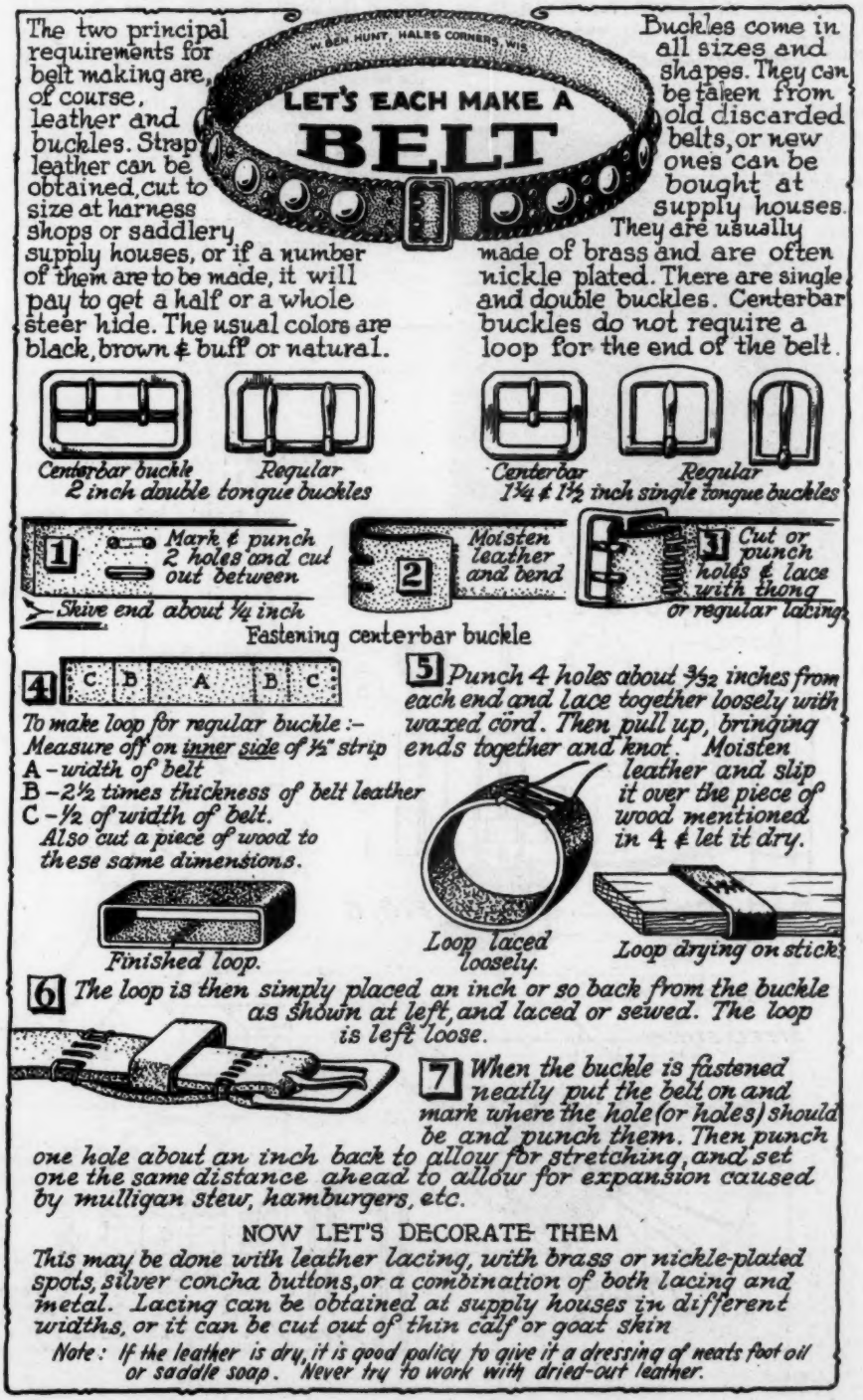
Edward H. Crussell, Sacramento, California

In an article entitled "Safety First—Common Sense a Poor Second," which appeared in the December, 1921, issue of this magazine, the writer set forth his critical and unfavorable opinion of the use of printed rules and safety placards posted in a school shop.

In the seventeen years since that article was printed, he has seen little reason to change his views as then expressed. Yet, there is, after all, a place for a certain amount of printed safety precaution and he has for several years past been using the material shown on the enclosed sheet. An effort was made to keep this list of rules as brief as possible, for the reason that "The less you say the more people remember." And, of course, this list doesn't cover any of the real safety precautions in the use of the machines. These are taught to the pupil at the machine, the first time he uses it, the most important rule of all being: *"You must get the instructor's permission every time you start the machine, no matter if you use it several times in one lesson period."* This rule takes care of several important things, one of them being that no machine may be started while the instructor is out of the room.

A careful check is kept of the pupil's actions and reactions the first few times he uses any machine, and any willful violation or omission of the safety precautions as taught, bars the pupil from the use of the machine until he is ready to make amends. A repetition of the offense may mean his expulsion from the class, the instructor refusing to be responsible for one who willfully disobeys in matters of this kind.

The sheet of rules is used in the following manner: At the beginning of the term, when a new class appears, each pupil is given two copies of the rules. The rules are then read aloud, one rule at a time, by the entire class in unison. After the reading of each rule, the instructor expounds and


W. BEN HUNT, HALES CORNERS, WIS.
LET'S EACH MAKE A
BELT
The two principal requirements for belt making are, of course, leather and buckles. Strap leather can be obtained, cut to size at harness shops or saddlery supply houses, or if a number of them are to be made, it will pay to get a half or a whole steer hide. The usual colors are black, brown & buff or natural.
Buckles come in all sizes and shapes. They can be taken from old discarded belts, or new ones can be bought at supply houses. They are usually made of brass and are often nickle plated. There are single and double buckles. Centerbar buckles do not require a loop for the end of the belt.
Centerbar buckle
Regular
2 inch double tongue buckles
Centerbar
Regular
1¼ & 1½ inch single tongue buckles
1 Mark & punch 2 holes and cut out between
Skive end about ¼ inch
2 Moisten leather and bend
3 Cut or punch holes & lace with thong or regular lacing
Fastening centerbar buckle
4
C B A B C
To make loop for regular buckle:-
Measure off on inner side of ½" strip
A - width of belt
B - 2½ times thickness of belt leather
C - ½ of width of belt.
Also cut a piece of wood to these same dimensions.
5 Punch 4 holes about 3/32 inches from each end and lace together loosely with waxed cord. Then pull up, bringing ends together and knot. Moisten leather and slip it over the piece of wood mentioned in 4 & let it dry.
Finished loop.
Loop laced loosely.
Loop drying on stick
6 The loop is then simply placed an inch or so back from the buckle as shown at left, and laced or sewed. The loop is left loose.
7 When the buckle is fastened neatly put the belt on and mark where the hole (or holes) should be and punch them. Then punch one hole about an inch back to allow for stretching, and set one the same distance ahead to allow for expansion caused by mulligan stew, hamburgers, etc.
NOW LET'S DECORATE THEM
This may be done with leather lacing, with brass or nickle-plated spots, silver concha buttons, or a combination of both lacing and metal. Lacing can be obtained at supply houses in different widths, or it can be cut out of thin calf or goat skin
Note: If the leather is dry, it is good policy to give it a dressing of neats foot oil or saddle soap. Never try to work with dried-out leather.

explains further, giving the reasons for the rule and offering opportunity for the pupils to ask questions or offer objections to what they may think to be unnecessary restriction. When the reading and discussion are over, the pupil signs one copy and passes it up to the desk. He keeps the other copy for his notebook.

It is not expected that this list of rules will be accepted by the reader in its entirety. He may even think that most of the six are puerile and unnecessary. Indeed, in the present instance, rules 1 to 4 were found necessary because of students coming from schools where no attention had been given to these matters.

From the instructor's viewpoint, the chief value of the rule sheet is for those students who join the class at odd times after the term has started. Under press of other matters, the instructor may overlook the need of giving this new pupil the information that was given to the others. The rule sheet takes care of this and, in practically every instance, seems to give the newcomer a favorable opinion of the school shop.

The rules are printed a few hundred at a time by the school printshop, at whatever time suits them best, upon whatever paper they may happen to have handy.

RULES

For Pupils in Woodshop

1. Get here on time — tardiness is not permitted.
2. Once in the room, do not leave it without permission. Do not go to the second floor without permission except at the beginning and end of the period.
3. When the whistle blows, come to attention instantly! This will save time for everybody and may prevent an accident.
4. Do not tamper with switches or window shades, nor with the lockers or materials of other pupils.
5. Keep your fingers off all machines, even when they are not running, except when you have permission to use them.
6. These rules are made for your benefit, do not break them. If one pupil is permitted to break a rule, then all must be given the same privilege and there is no use having the rule.

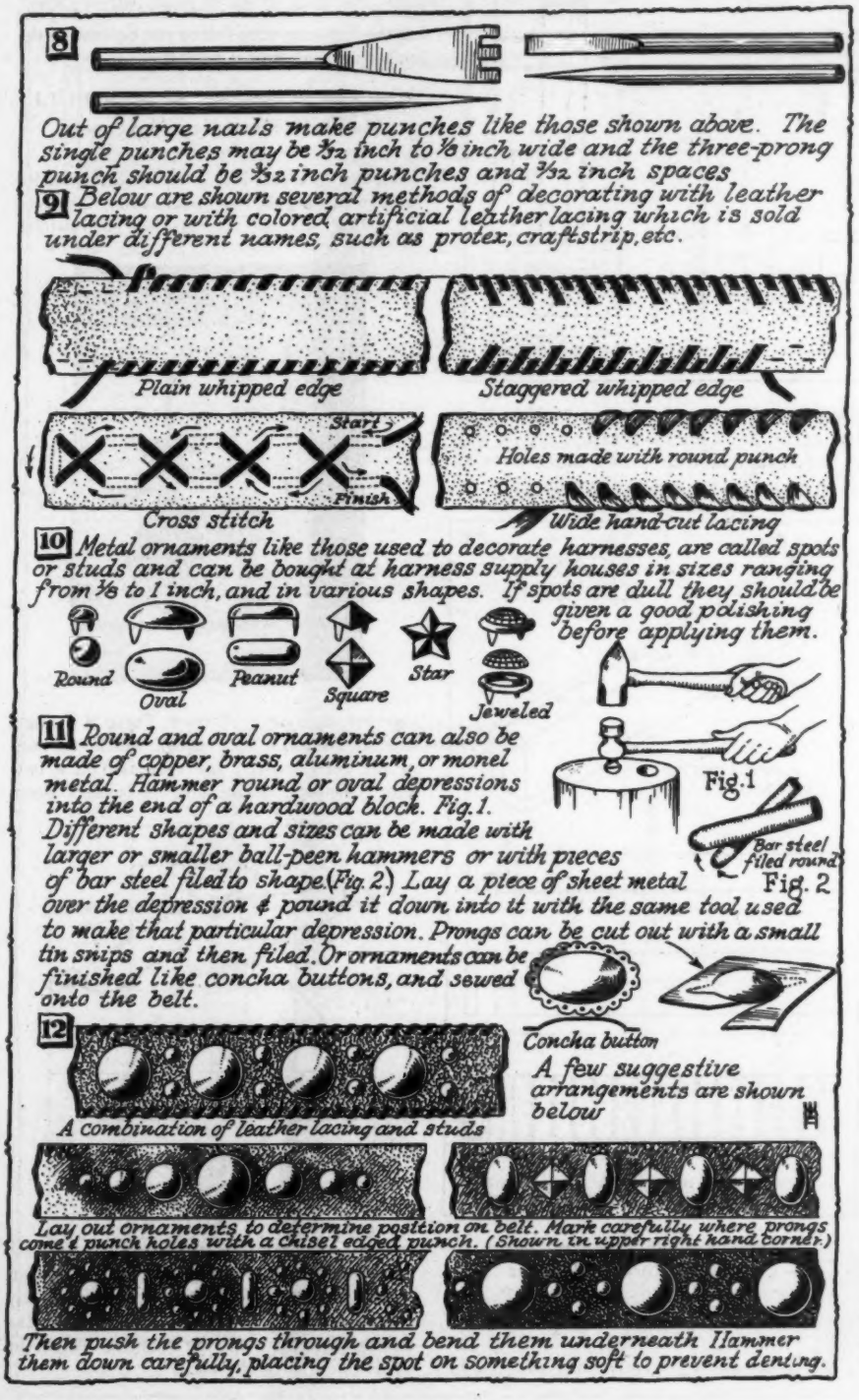
Finally, woodwork is an interesting subject and teaches many useful things. Why not take advantage of your opportunities? Try to believe that you can have more fun doing something useful than you can in loafing and getting into mischief.

E. H. Crussell, Instructor

Approved — *Beth Hughson,* Principal

I have read and understand the above rules.

Signed .....


8
Out of large nails make punches like those shown above. The single punches may be 3/32 inch to 1/8 inch wide and the three-prong punch should be 3/32 inch punches and 3/32 inch spaces
9 Below are shown several methods of decorating with leather lacing or with colored artificial leather lacing which is sold under different names, such as protex, craftstrip, etc.
Plain whipped edge
Staggered whipped edge
Start
Finish
Cross stitch
Holes made with round punch
Wide hand-cut lacing
10 Metal ornaments like those used to decorate harnesses, are called spots or studs and can be bought at harness supply houses in sizes ranging from 1/8 to 1 inch, and in various shapes. If spots are dull they should be given a good polishing before applying them.
Round
Oval
Peanut
Square
Star
Jeweled
11 Round and oval ornaments can also be made of copper, brass, aluminum, or monel metal. Hammer round or oval depressions into the end of a hardwood block. Fig. 1. Different shapes and sizes can be made with larger or smaller ball-peen hammers or with pieces of bar steel filed to shape. (Fig. 2.) Lay a piece of sheet metal over the depression & pound it down into it with the same tool used to make that particular depression. Prongs can be cut out with a small tin snips and then filed. Or ornaments can be finished like concha buttons, and sewed onto the belt.
Fig. 1
Bar steel filed round
Fig. 2
Concha button
12
A few suggestive arrangements are shown below
A combination of leather lacing and studs
Lay out ornaments to determine position on belt. Mark carefully where prongs come & punch holes with a chisel edged punch. (Shown in upper right hand corner.)
Then push the prongs through and bend them underneath Hammer them down carefully, placing the spot on something soft to prevent denting.

BOOK ENDS

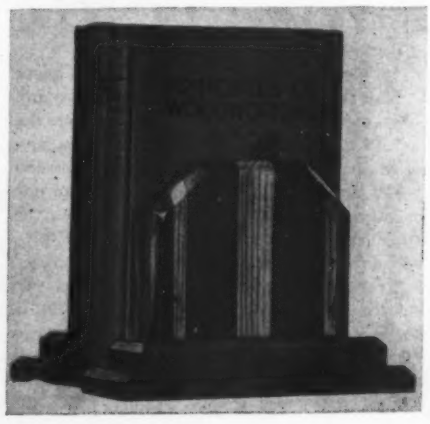
John G. Lehocky, Ironwood Township Schools, Ironwood, Michigan

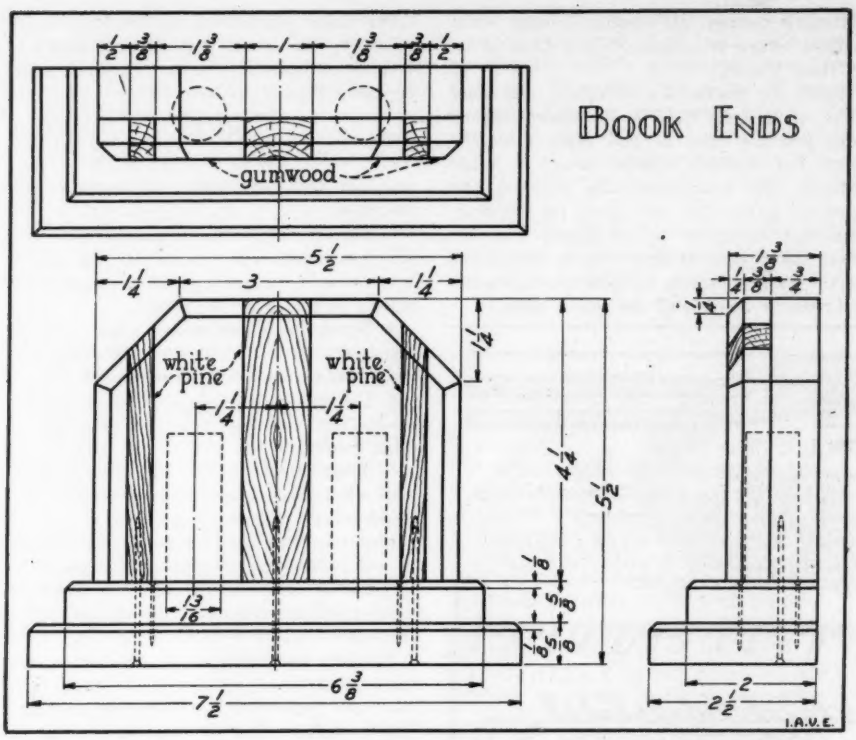
These loaded book ends make an interesting problem for the students of the junior-high-school level, as many operations are involved.

The wood used in making this project is gumwood and white pine. Other suitable cabinet woods, however, may be substituted.

Procedure

To Make the Base: Square up two pieces of stock, one being 5/8 by 5 1/4 by 7 1/2 in. and the other 5/8 by 4 1/4 by 6 3/8 in. Plane a 3/16-in. chamfer on both pieces. Gauge a line one half the width of each piece and then rip. Plane the





two larger pieces 2½ in. wide and the two smaller pieces 2 in. wide. Sandpaper the pieces.

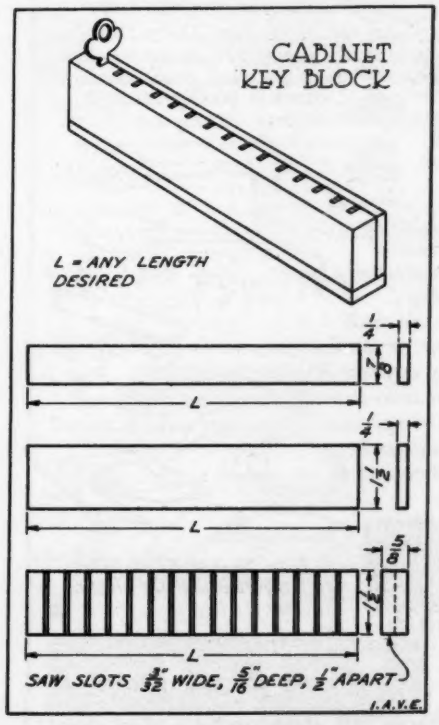
Take one half the length of each piece and square a light pencil line across both surfaces and the edge just planed. To assemble the base, apply a thin coat of glue to the bottom surface of the smaller pieces. With the smaller and the larger pieces centered and the edges flush, nail together with four 1-in. finishing nails. Wipe off any surplus glue which has squeezed out of the joint.

To Make the Uprights: All stock used in making the uprights should be ¾ in. in thickness and 9 in. in length.

Plane pieces of gumwood and white pine to the widths indicated in the drawing. Allow ¼ in. more for waste on the two outside pieces. Fit the pieces edge to edge properly with the grain of the wood running in the same direction. Number the pieces and glue. After the glue has dried, take the piece out of the clamps and plane one face true. Cut a piece of gumwood, surfaced on two sides, the same size as the piece taken out of the clamps. Apply glue to the face and to the face of the piece just planed. Clamp up face to face and let dry.

Measure ½ in. outside of each ⅜-in. piece of pine for the width of the book ends, and plane these edges square. Then square the ends. Set the marking gauge at 1⅜ in. and gauge the thickness from the solid gumwood face. Plane to the correct thickness. Take one half the length, and square a line across the true edge and the two faces. Saw in half, thus producing two uprights.

Arrange the two uprights so that the two squared ends and true edges are flush. Cut a piece of thin cardboard the size of the two uprights. Apply glue in spots to the cardboard and clamp between the two uprights with hand clamps. After this has been done, finish the upright to the correct length and width. Next lay out the bevel. Remove waste material with a back saw and then plane. Make a ⅜-in. chamfer as shown in the drawing. Split the uprights apart with a wood chisel and then sand.



Cabinet-key block designed by O. H. Olson, Rockford, Illinois

To Load the Uprights: Bore two 2¼-in. holes in the bottom of each upright with a No. 13 auger bit. Cut four pieces of ¾-in. pipe 2⅛ in. long and load with lead. Insert and wedge the four loaded pieces of pipe into the holes bored.

To Assemble the Book Ends: In assembling the book ends, clamp the uprights bottom side up in the vise. Apply a thin coat of glue to the bottom and nail the base to the upright with three 7d finishing nails.

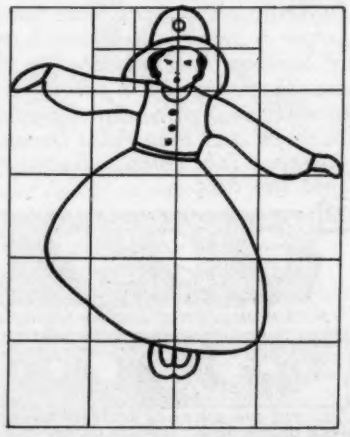
To Finish the Book Ends: To finish the book ends, apply a coat of linseed oil to darken them. After the oil has dried, apply a coat of shellac and then finish by applying two or more coats of varnish. After completing the finishing, glue felt to the bottom of the book ends and trim it to size.

BALANCING-GIRL SHADE PULL

Hazel F. Showalter, Davenport, Nebraska

A piece of wood 4 by 5 in. in size is needed for this shade pull, but material may be saved by fitting several tracings of the pattern

together on a piece of wood. There is a single hole in the girl's hat through which the ends of the cord are run and then tied in a bow knot. One loop of the cord is brought down



and knotted about the girl's waist for a belt.

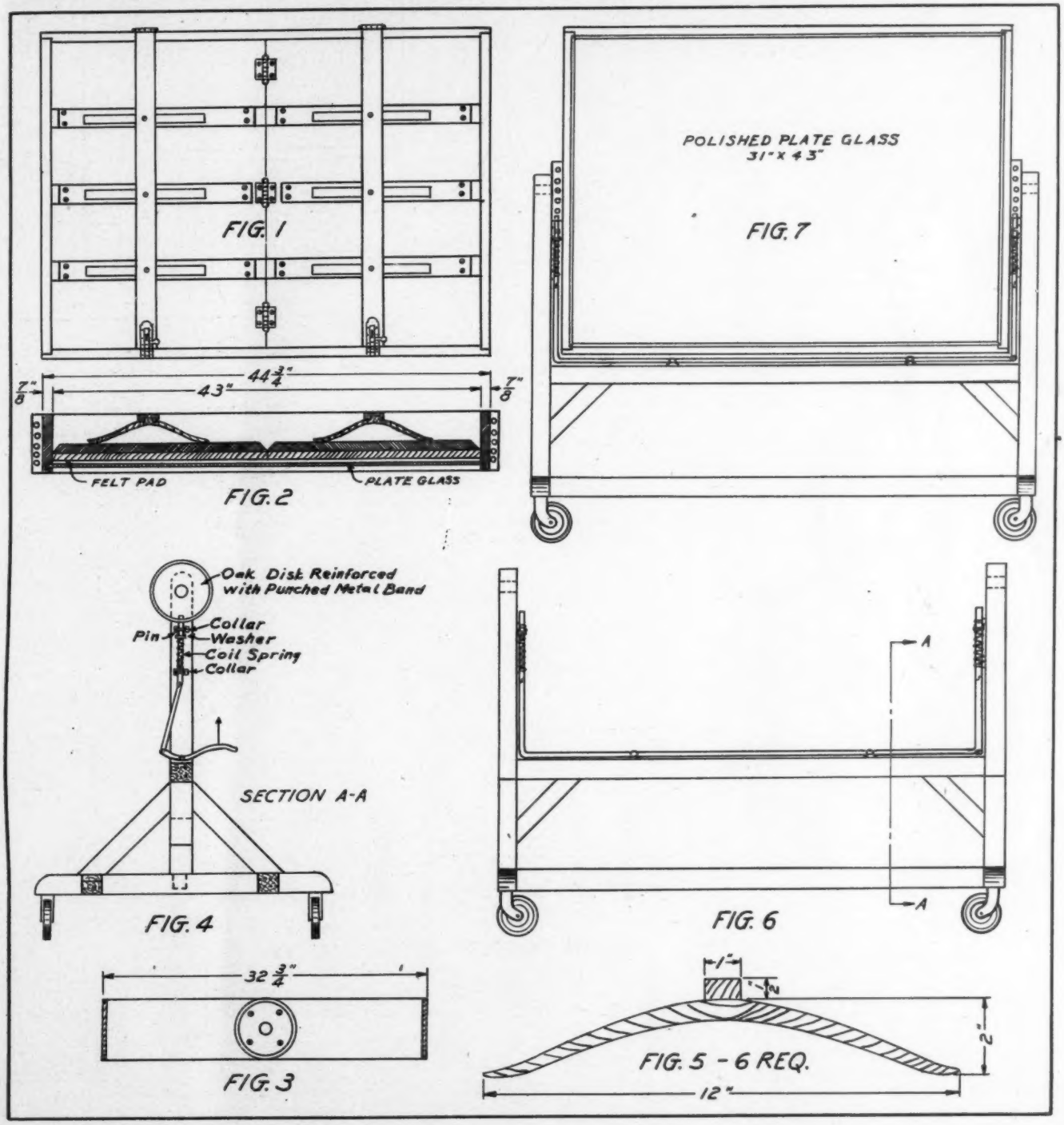
The girl's costume may be painted in any color to match or to harmonize with the decorative scheme of the room in which the shade pulls are to be used.

SOLAR PRINTING FRAME

Leslie H. Murphy, Ottawa, Kansas

This printing frame is designed with a glass surface, 31 by 43 in. so as to make large prints. Figure 1 shows the bottom view. You will note that the frame is constructed with rabbet joints. The frame is rabbeted around the top ¾ in. deep so as to make a place for the glass. The glass is held in place with a strip fastened with screws as shown in Figure 2. The glass used is polished plate glass. A felt pad is placed next to the glass so as to give the tracing an even pressure. Next to the pad is a board covering which is hinged in the middle. It has three strips across fastened with screws so as to keep the boards from warping, and to make a place for the springs. The boards are held in place with two strips as shown in Figure 1. The strips have three oak spring clamps each. Figure 5 shows the construction of the spring clamps. You will note in Figure 2 how the springs are fastened to the strips. The strips holding the springs are hinged to the back and have a door bolt to fasten the front. Care must be taken that all the springs are of even pressure. Figure 3 shows the end view of the printing frame. You will note that the oak disk is fastened in the middle. The disk is reinforced with a metal band. Holes are punched every inch in the metal band and bored into the oak disk.

The carriage is constructed next. Figure 6 shows the side elevation. Figure 4 shows the end elevation and the working of the locking device. The carriage is equipped with hospital casters, making it noiseless. Figure 7 shows an assembly drawing of the frame and carriage. A suitable finish should, of course, be given to the finished printing frame.



Bill of Material

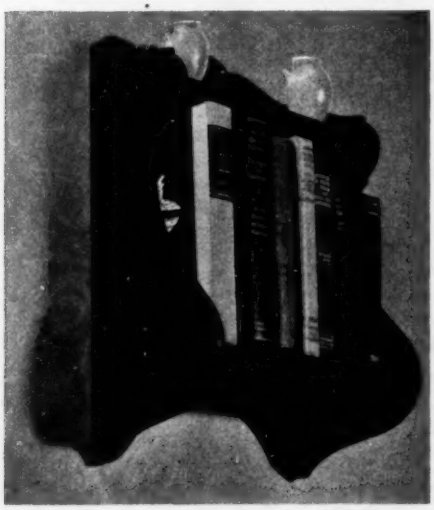
No. Required	*Name*	*Material*	*Size*
2	Sides	Oak	1 x 8 x 48 in.
2	Ends	Oak	1 x 8 x 36 in.
1	Board covering	White pine	1 in. x 12 in. x 12 ft.
3	Supports	Oak	1 x 2 x 48 in.
6	Springs	Oak	1 x 3 x 13 in.
2	Strips for springs	Oak	1 x 2½ x 36
1		Felt pad	31 x 43
1		Polished plate glass	32 x 44
2	Uprights		2 x 2 x 32
2	Base		2 x 2 x 31
4	Braces		2 x 2 x 14
3	Cross-pieces		2 x 2 x 48
4	Hospital casters		4 x 1
2	Door bolts		
1	Locking device		
1	Dowel Screws		1 x 12
5	Hinges, loose pin-ball tip steel butt		2-in. joint

WALL SHELF

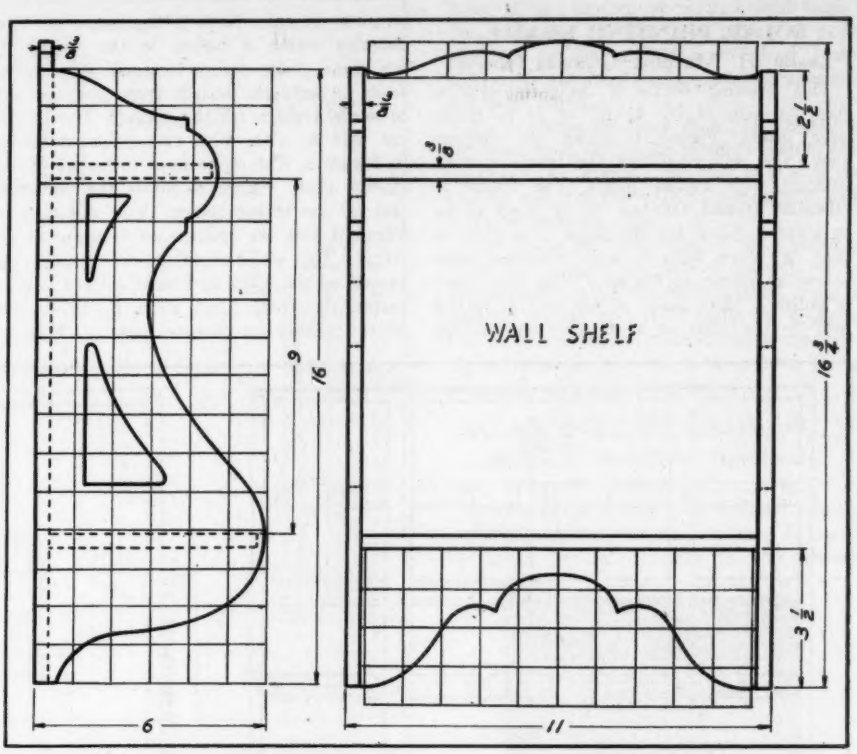
Raymond Getman, Philadelphia High School, Philadelphia, New York

The wall shelf shown here makes a very suitable project for beginners in woodworking because of the many tool operations which are involved. It may also serve to teach some basic principles of design as well as the method of enlarging by squares.

The type of wood selected for its construction depends on the kind of finish to be applied. If you plan to use a quick-drying enamel or lacquer, pine or poplar will be found suitable.



Stock for the sides should be squared to dimensions given in the drawing. Using template prepared by enlarging of squares, transfer design to sides and cut out with coping saw. Curves should be smoothed and finished with a spokeshave and sandpaper. These same directions may be followed for the construction of the back, while the shelves need only to be squared to size.



Several methods of assembly will be found suitable but for beginners the use of nails is the easiest method. All nails should be set and the holes filled with wooden pegs.

After the stain is applied and allowed to dry, apply three coats of shellac rubbing between each coat with fine abrasive paper or steel wool. A final coat of varnish or lacquer is then applied. When thoroughly dry, rub with steel wool and apply a coat of wax. Screw eyes may be inserted in sides for hanging.

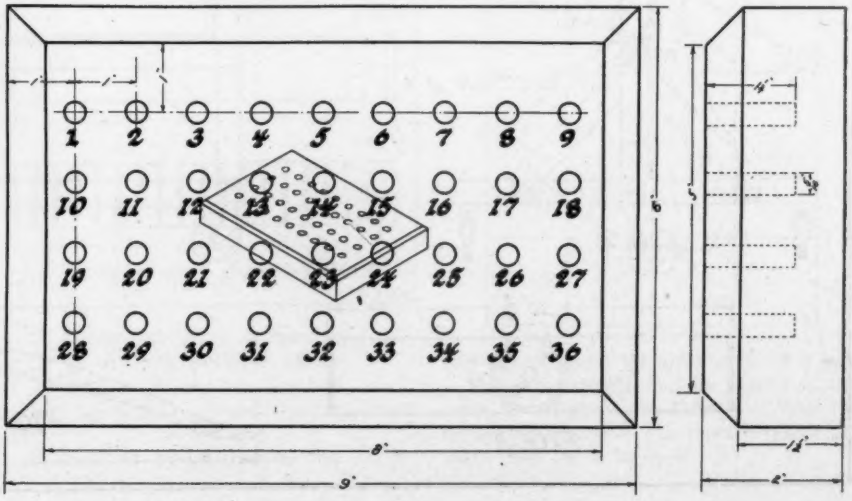
PENCIL HOLDER

F. N. Newton, Jr., Senior High School, Sharon, Pennsylvania

In our mechanical-drawing classes pencils are issued free to the students. We had always had considerable trouble due to students forgetting to leave the pencils in their desk drawers at the close of the class period. In order to overcome the loss of so many pencils, we made a block out of oak similar to the drawing shown. After the block was cut out, planed, drilled, and sanded, we numbered each hole to correspond with the desk numbers in the drawing room. Then the block was finished by applying three coats of varnish, the last being rubbed to a satin finish.

At the beginning of the class period, the student comes to the desk and secures his pencil and replaces it at the close of the period. A check on the pencils can be made at the close of each period simply by glancing at the block.

By the use of this little device, our pencil consumption has dropped considerably.



A SMALL EFFICIENT BAR FOLDER

Anderson G. Long, Instructor of Metalwork, Westport Senior High School, Kansas City, Missouri

The bar folder herein illustrated was designed to meet the need of the small shop which demands a good bar folder, but yet has too limited an allowance to purchase a more elaborate folder. The designer also had in mind its usefulness as a practical project for the metal shop. It is also a very desirable piece of equipment for the metal-shop boy to make for his home workshop.

The construction of the folder is very simple. The only expensive equipment necessary for its construction is a metal lathe. The collar-type hinges must be turned on the lathe. A small amount of spot welding is necessary, but can be done at the neighborhood garage at very little expense, if welding equipment is not available in the shop. It is recommended that ¼- by 1½-in. angle iron be used for the folding bars.

This folder has been thoroughly tried out in several shops and its operation is extremely satisfactory. The collar-type hinges make the folding bar operate in a true arc. If the dimensions and specifications of the drawing are followed closely a very useful piece of equipment can be added to the shop.

WORKBENCH FOR HOME OR SCHOOL USE

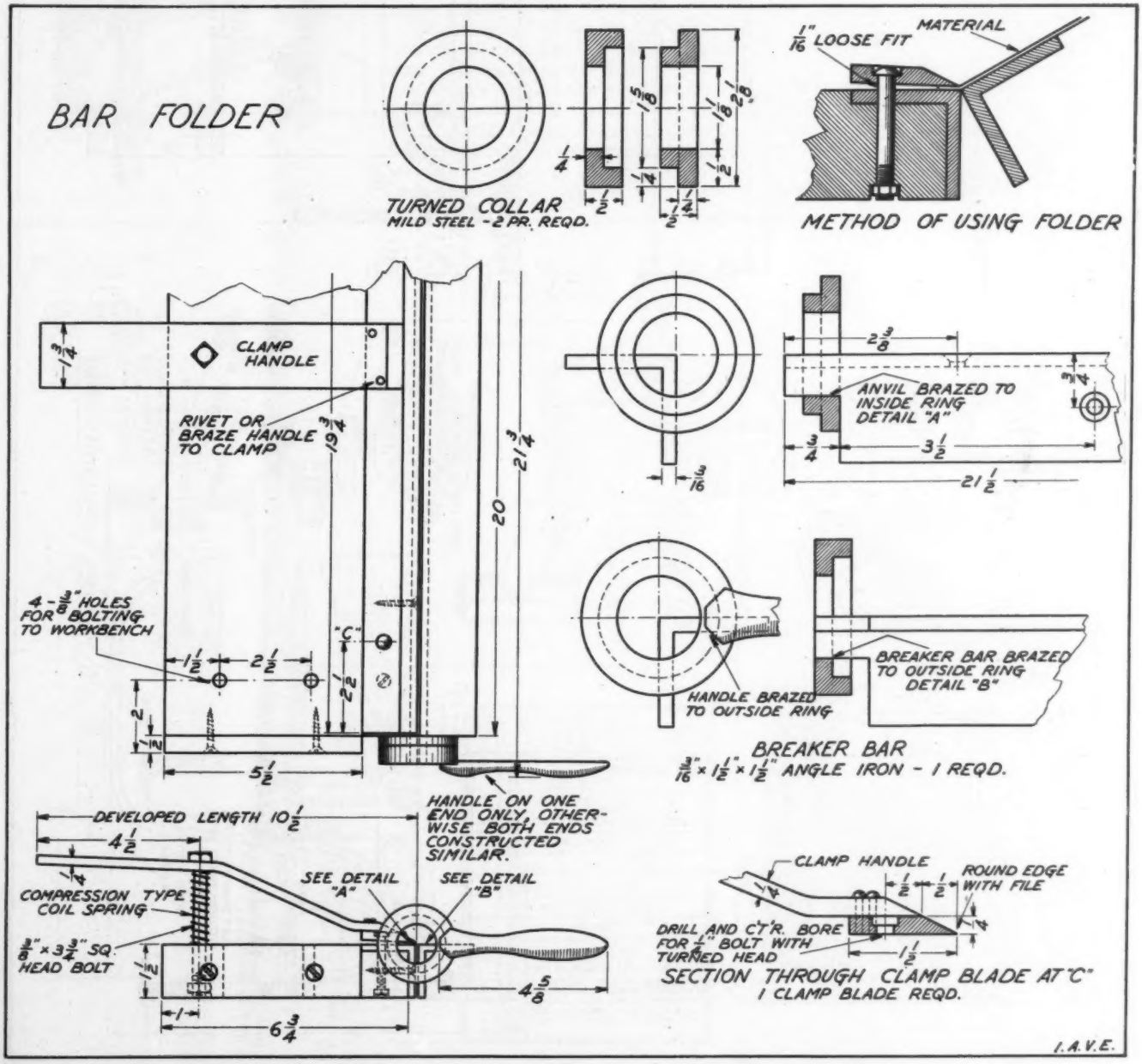
Ross C. Cramlet, Amos Hiatt Junior High School, Des Moines, Iowa

A simple, sturdy, and inexpensive workbench which may be easily constructed in a very short time is an important article for the father or son who desires to become a home workshop craftsman.

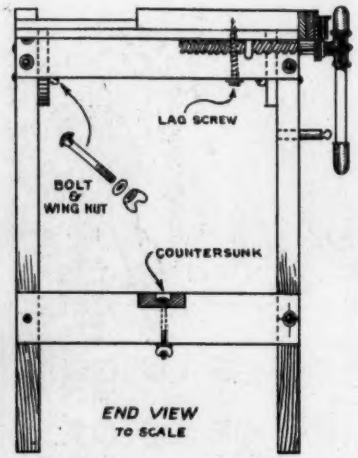
The materials used in this bench may be purchased at any lumber yard at an approximate cost of $4. Many standard vise manufacturers offer vises which are entirely satisfactory.

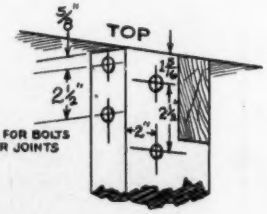
The construction of the top of the bench is very simple. A piece of 2 by 12-in. fir is used for the front part of the bench, and a ½-in. piece of pine is used for the bottom of the well. The strip on the back is placed on top of the well bottom with glue and screws from underneath. The thickness is on a plane with the front of the bench. The ends of the well hole are left open for convenience in cleaning.

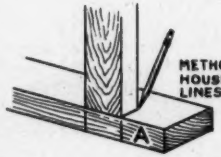
The bench top is held together by ¾-in. pine boards which are placed underneath with glue and screws. The width of these pieces on each end is arranged so as to fit tightly against


BAR FOLDER
TURNED COLLAR
MILD STEEL - 2 PR. REQD.
1/16" LOOSE FIT
MATERIAL
METHOD OF USING FOLDER
CLAMP HANDLE
RIVET OR BRAZE HANDLE TO CLAMP
4 - 3/8" HOLES FOR BOLTING TO WORKBENCH
"C"
ANVIL BRAZED TO INSIDE RING DETAIL "A"
BREAKER BAR BRAZED TO OUTSIDE RING DETAIL "B"
HANDLE BRAZED TO OUTSIDE RING
BREAKER BAR
3/16" x 1 1/2" x 1 1/2" ANGLE IRON - 1 REQD.
DEVELOPED LENGTH 10 1/2
HANDLE ON ONE END ONLY, OTHERWISE BOTH ENDS CONSTRUCTED SIMILAR.
SEE DETAIL "A"
SEE DETAIL "B"
COMPRESSION TYPE COIL SPRING
3/8" x 3 3/4" SQ. HEAD BOLT
CLAMP HANDLE
ROUND EDGE WITH FILE
DRILL AND C'T'R. BORE FOR 1/2" BOLT WITH TURNED HEAD
SECTION THROUGH CLAMP BLADE AT "C"
1 CLAMP BLADE REQD.
I.A.V.E.

PROJECT - WORKBENCH

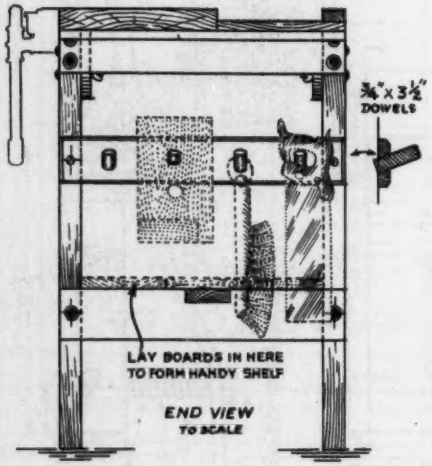




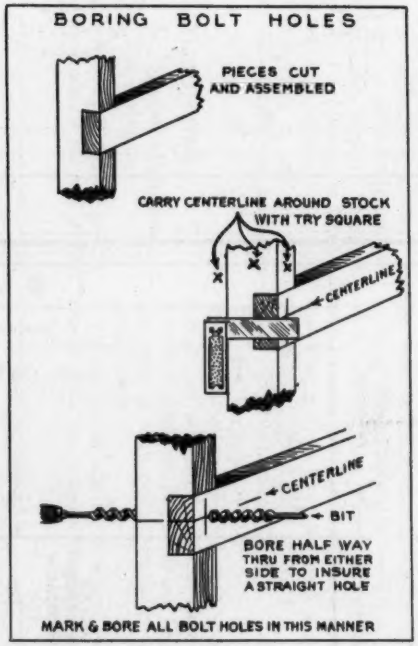


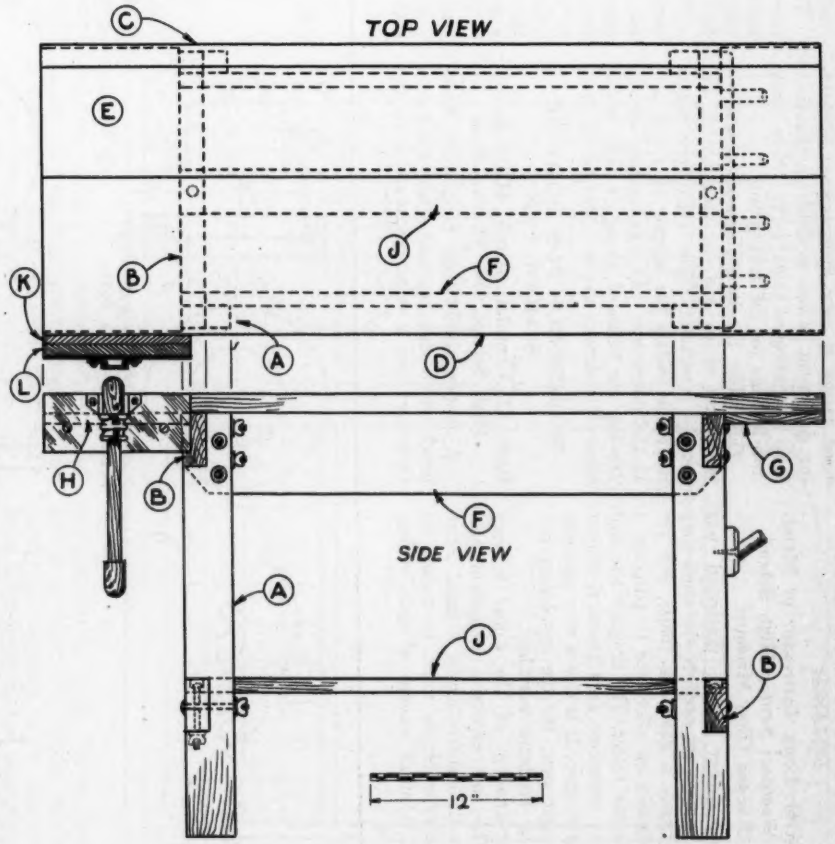
MATERIALS

4 PCS.	2" × 4" × 29¼"	PINE	A	H	1 PC.	1" × 9¾" × 20⅝"	PINE
4 PCS.	2" × 4" × 20"	"	B	J	1 PC.	1" × 3¼" × 36¾"	"
1 PC.	2 " × 2" × 54¼"	"	C	K	1 PC.	½" × 2½" × 10¼"	HARDWOOD OAK OR WALNUT
1 PC.	2 " × 11½" × 54¼"	"	D	L	1 PC.	¾" × 2½" × 10¼"	" "
1 PC.	1 " × 9¼" × 54¼"	"	E		22 - ⅜" × 4" IRON BOLTS		22 WING NUTS
2 PC.	1" × 5½" × 36¾"	"	F		44 - ⅜" WASHERS		2 - ⅜" × 5" LAG SCREWS
1 PC.	1" × 6⅜" × 20⅝"	"	G		1 SET IRON PARTS FOR VISE		



BORING BOLT HOLES


PIECES CUT AND ASSEMBLED
CARRY CENTERLINE AROUND STOCK WITH TRY SQUARE
CENTERLINE
CENTERLINE
BIT
BORE HALF WAY THRU FROM EITHER SIDE TO INSURE A STRAIGHT HOLE
MARK & BORE ALL BOLT HOLES IN THIS MANNER



the top rail of the undercarriage and to space the top properly. Sometimes a thicker piece might be used on the front of the bench where the vise is placed to bring it flush with the top of the bench without having to block up underneath. This, of course, would depend on the depth of the vise to be used. The construction of the undercarriage of the bench is illustrated and is self-explanatory.

If a good grade of material is used and each piece is dressed and sanded, it would be well to apply a coat of shellac to the bench and then to finish with two coats of good varnish. After the varnish is thoroughly dry, paint the bolt heads black.

The height of the bench may be varied according to the height of the person for whom it is made. Perhaps the outstanding feature of this project is the manner in which it is put together. It may be taken apart by removing ten wing nuts and two lag screws. This makes the bench easily transportable from one place to another, or it may be put into very small storage space when it is not in use.

IRON TABLE LAMP

Harold O. Akeson, Maplewood, New Jersey

The lamp illustrated and described herewith is very simple and can be made of wrought iron in a short time by any amateur craftsman. This particular lamp is intended for use on either a small or large table.

The first step is to lay out the pattern for leg, full size, on a piece of ordinary wrapping paper. Divide the paper, 8 by 12 in., into 1-in. squares, and carefully lay out the shape of the leg from the graph drawing. Next cut three pieces of strap iron ⅛ by ½ by 17 in. Flare both ends of each of the pieces and bend one end around a 1-in. pipe for the top scroll. Lay the work on the pattern at this stage to check the curve. Make the right-angle bend, and check again. Then make the bottom scroll. Locate and drill two 3/16-in. holes in each leg.

For the post obtain a piece of ¼ by 9-in. gas pipe. Thread one end for a ⅛ by ¼-in. reducer. The bottom end can be filed square. Lay out the location for the holes on the pipe, and drill and tap them for 8-32 machine screws.

The husk may be made by hand, or it may be purchased. It is not difficult to make. Veining is done with a chasing tool or a small blunt cold chisel.

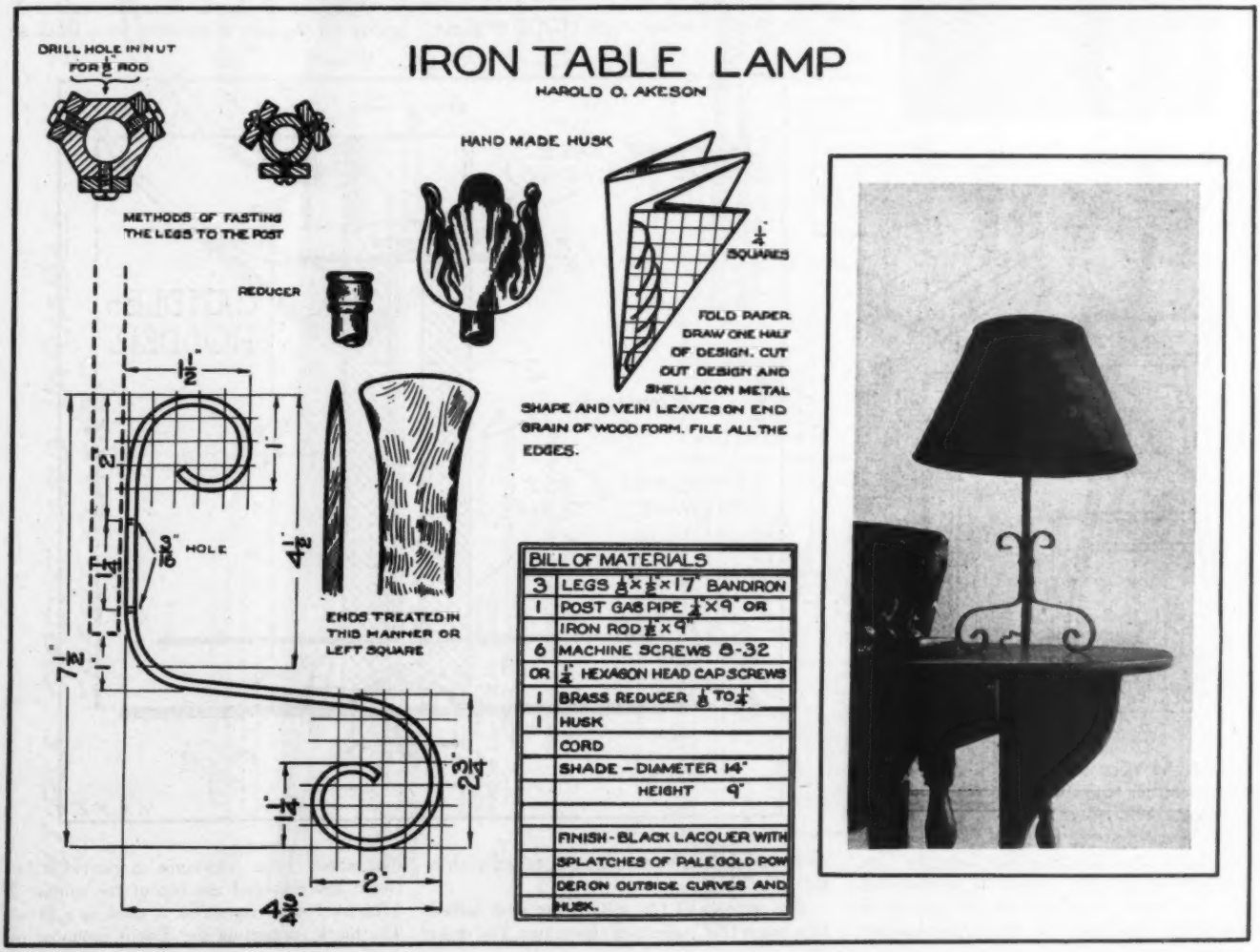
Finally assemble all parts after having cleaned them with a piece of emery cloth and apply two coats of flat lacquer. If desired, the ends of scrolls and veins of husks may be lightly bronzed.

The selection of the proper-size shade is essential in making the lamp look very well. This point is often overlooked.

PRESERVING REFERENCE TABLES

Reference tables and drawings to be used in the school shop will last longer if they are dipped into white shellac, light varnish, or colorless lacquer.

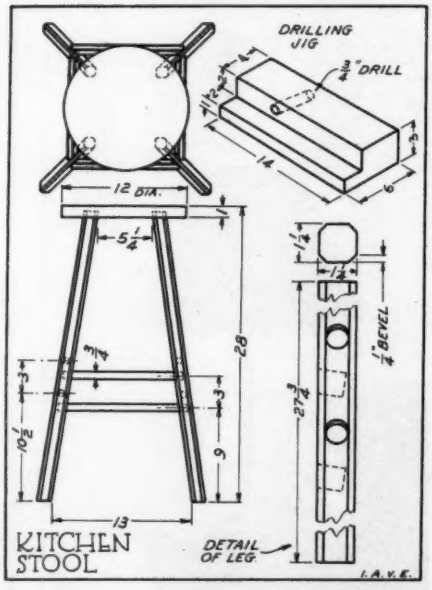
After dipping, hang them up so that the liquid can drain off readily while drying.


IRON TABLE LAMP
HAROLD O. AKESON
DRILL HOLE IN NUT FOR ⅛ ROD
METHODS OF FASTING THE LEGS TO THE POST
REDUCER
HAND MADE HUSK
¼ SQUARES
FOLD PAPER DRAW ONE HALF OF DESIGN. CUT OUT DESIGN AND SHELLAC ON METAL
SHAPE AND VEIN LEAVES ON END GRAIN OF WOOD FORM. FILE ALL THE EDGES.
3/16" HOLE
ENDS TREATED IN THIS MANNER OR LEFT SQUARE
BILL OF MATERIALS
3 LEGS ⅛ × ½ × 17" BANDIRON
1 POST GAS PIPE ¼" × 9" OR
IRON ROD ½ × 9"
6 MACHINE SCREWS 8-32
OR ¼" HEXAGON HEAD CAP SCREWS
1 BRASS REDUCER ⅛" TO ¼"
1 HUSK
CORD
SHADE — DIAMETER 14"
HEIGHT 9"
FINISH - BLACK LACQUER WITH SPLATCHES OF PALE GOLD POWDER ON OUTSIDE CURVES AND HUSK.

KITCHEN STOOL

Henry O. Robinson, Junior High School, Redlands, California

The kitchen stool here represented is a project that can be used by the junior-high-school shop teacher when limitations of machinery make it impossible to build very many large pieces of furniture for school or home use. A survey of several classes in our shop



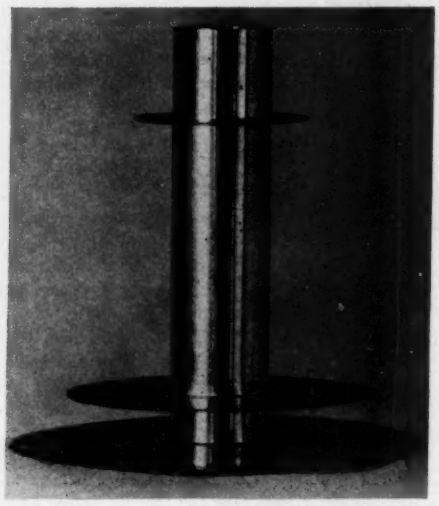
showed that less than 30 per cent of the mothers of our students owned a kitchen stool to lighten their labors.

The detail drawing is self-explanatory. The top of the stool can be easily fashioned and the legs sawed and planed as represented. The jig insures a perfect fit for the ¾-in. rounds for which dowel stock may be obtained.

MODERNISTIC CANDLEHOLDER

Samuel Cravotta, Director Industrial Arts, Woodrow Wilson High School, Waynesboro, Virginia

The column of the candleholder shown herewith is made of aluminum. It is turned, sanded with Speed-wet abrasive, drilled, and

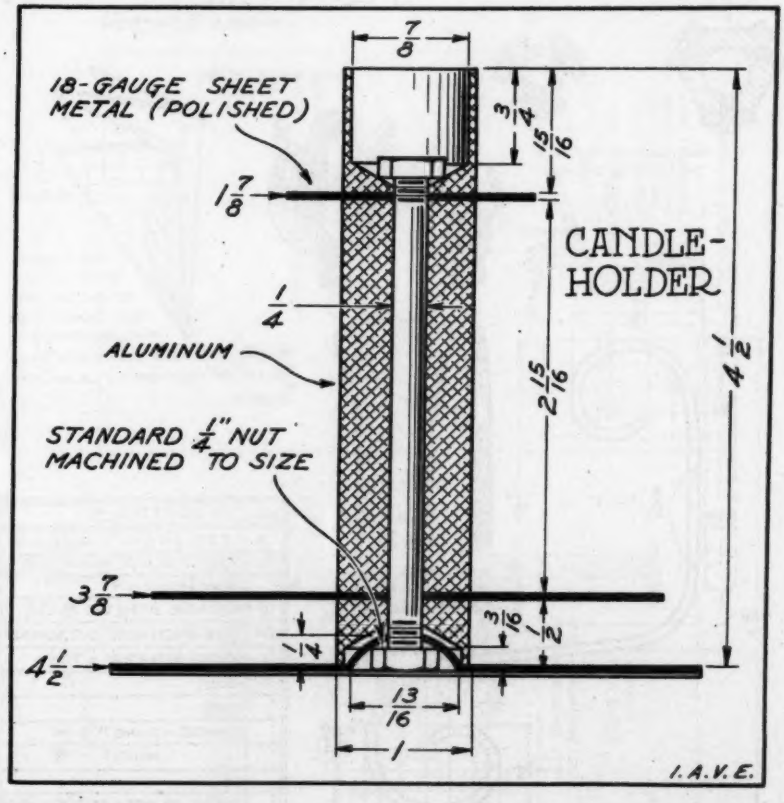


parted into three sections with an engine lathe.

The three disks are made of No. 18 gauge sheet metal. The bottom disk is raised with a ball-peen hammer.

The sections of the column are next buffed to a finish that resembles chromium. The disks are painted with black enamel. After assembly, a thin piece of felt is glued to the bottom disk.

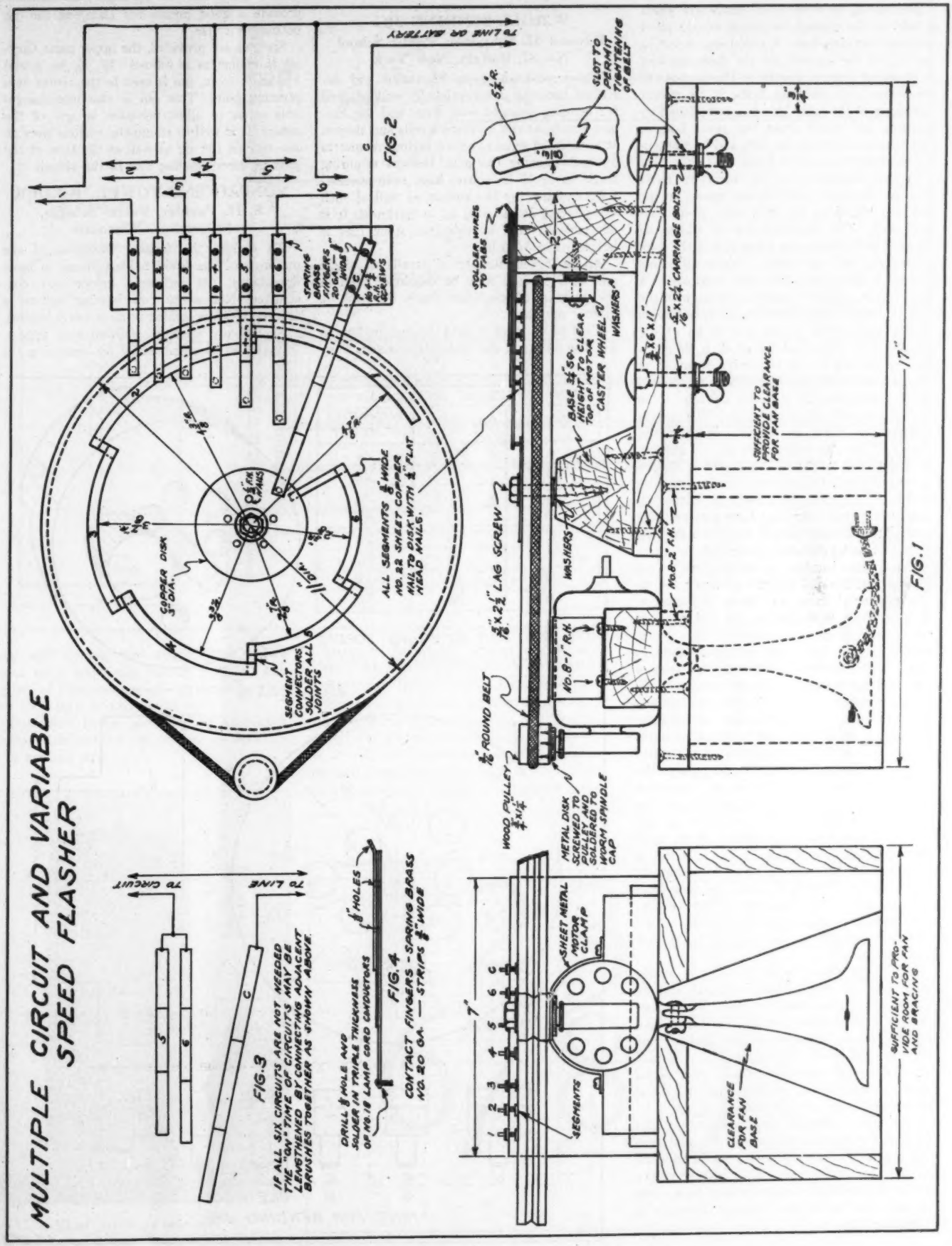
This same project can be easily adapted to make an attractive boudoir lamp to harmonize with modernistic furniture.



A MULTIPLE CIRCUIT AND VARIABLE SPEED FLASHER

E. A. Rerucha, Leyden Community High School, Franklin Park, Illinois

An oscillating electric-fan motor was used to supply the driving power for this serviceable circuit flasher. The fan blade is removed and the motor is mounted in the support as shown in Figure 1. A small wood pulley with a V groove is screwed to a metal disk and the disk with the pulley is securely soldered to the worm spindle cap of the oscillating mechanism. As this spindle turns at a greatly reduced speed as compared with the motor, it makes an ideal and inexpensive speed-reducing mechanism for a flasher of this type. The motor is clamped between two blocks, cut to fit the motor sides, with a sheet-metal clamp held down with screws. Since the spindle must be in gear with the motor-shaft worm, or in oscillating position, the base of the fan must be free to oscillate back and forth, and for this reason clearance must be provided for the movement of the base. A wood disk ¾ in. thick and 11 in. in diameter, with a V groove for the belt, is mounted on a block so that about ⅛-in. clearance is provided between the disk and the top of the motor. A 5/16 by 2½-in. lag screw is used as a pivot. The block supporting the disk is mounted on


MULTIPLE CIRCUIT AND VARIABLE SPEED FLASHER
FIG. 1
FIG. 2
FIG. 3
FIG. 4
TO LINE OR BATTERY
SLOT TO PERMIT TIGHTENING OF BELT
SOLDER WIRES TO TABS
CASTER WHEEL
WASHERS
CARRIAGE BOLTS
BASE 2½" SQ. HEIGHT TO CLEAR TOP OF MOTOR
SUFFICIENT TO PROVIDE CLEARANCE FOR FAN BASE
LAG SCREW
ROUND BELT
WOOD PULLEY
METAL DISK SCREWED TO PULLEY AND SOLDERED TO WORM SPINDLE CAP
SHEET METAL MOTOR CLAMP
SEGMENTS
CLEARANCE FOR FAN BASE
SUFFICIENT TO PROVIDE ROOM FOR FAN AND BRACING
SPRING BRASS FINGERS
ALL SEGMENTS ⅜" WIDE NO. 22 SHEET COPPER NAIL TO DISK WITH ½" FLAT HEAD NAILS.
COPPER DISK
SEGMENT CONNECTORS SOLDER ALL JOINTS
TO LINE
TO CIRCUIT
IF ALL SIX CIRCUITS ARE NOT NEEDED THE "ON" TIME OF CIRCUITS MAY BE LENGTHENED BY CONNECTING ADJACENT BRUSHES TOGETHER AS SHOWN ABOVE.
DRILL ⅜" HOLE AND SOLDER IN TRIPLE THICKNESS OF NO. 18 LAMP CORD CONDUCTORS
⅜" HOLES
CONTACT FINGERS - SPRING BRASS NO. 20 GA. — STRIPS ⅜" WIDE

a piece of ¾ by 6 by 11-in. hardwood which is held to the support by means of one pivot and one clamping bolt. A radial slot is cut in the top of the support for the clamping bolt as shown at right in Figure 1. The purpose of the pivot and clamping bolts is to permit tightening of the belt. This is accomplished by swinging the board about the pivot bolt so that tension is put on the belt, and by tightening the wing nuts on the bolts.

Copper segments, in the form of circle arcs, which cover equal angular spaces on the disk are nailed to the disk with ½-in. flathead nails. The segments are all connected together with connecting strips and to the 3-in. copper disk at the center. Solder all joints and sand down smoothly with sandpaper. A brass brush marked *C* makes contact with the disk at center thereby connecting all segments to the wire which is common to all of the circuits. The individual leg of each circuit is then connected to its respective segment as the disk revolves. Six segments are provided to accommodate six separate circuits to be flashed on and off periodically. The wiring diagram for these six circuits is shown in Figure 2. In case fewer than six are needed, or if the time length of the flashes is desired to be increased, the adjacent brushes may be connected together as shown in Figure 3. Since most oscillating fans have two or three speeds, the flashing periods may also be controlled by using different motor speeds.

The contact brushes are made up of spring brass about No. 20 gauge and laminated to give greater stiffness, as shown in Figure 4. A ⅛-in. hole is drilled in the end of each brush into which are soldered three ¾-in. lengths of No. 18 copper lamp-cord conductors. The conductors should be twisted together and flared out slightly at the bottom. Trim the contact end with tin snips to uniform length so that all strands make contact. The brushes should be adjusted so as to press firmly against the segments but not to produce unnecessary friction. The purpose of the stranded contacts is to produce a positive contact without arcing and undue friction. The brushes are mounted on a wood block, the height of which should be about ⅜ in. more than the top of the disk. A caster wheel is mounted on the side of the brush-support block under the disk to keep the disk from sagging due to the pressure of the brushes. Rub paraffin wax on the brush paths on the disk to reduce the friction between the brushes and the wood.

When the flasher is not in use, the motor may be removed, the blades replaced, and the fan used for the usual purpose. The flasher will be found very serviceable for special lighting effects, window-display lighting, and experimental work. *It is adaptable for much heavier service than the ordinary flash socket and ten amperes may be carried by each brush if proper contact is maintained.*

The motor with the small pulley may also be used for other purposes where a slow driving speed is necessary as for small window-display turntables, etc. If a double-groove pulley is provided, the device may be used to operate the flasher and a small turntable at the same time.

SCROLL-BENDING JIG

Edward M. Schreiber, Public School No. 82, Buffalo, New York

The scroll-bending jig illustrated and described herewith is exceptionally well adapted for bending wrought iron, wire, and the like, into numerous and accurate scrolls and shapes. It is designed so as to afford various diameters by interchanging the pins. Designs requiring stock up to ⅜ in. square have been successfully executed by the author, as well as such using metal down to ⅛ in. in thickness. It is advisable to heat wrought-iron stock that is heavier than 3/16 in.

An unlimited number of scrolls of single and double bends may be developed, and in the making of duplicate parts the task is greatly simplified.

Cold rolled stock is used throughout for the jig. The offsets at the bottom are milled. They provide a good means for clamping the jig bottom in a vise.

Six pins are provided, the upper parts varying in diameters as follows: ⅜, ½, ¾, 1, and 1½ in. A ½-in. pin is used in the center as a pivoting point. This pin is also interchangeable so as to allow insertion of any of the others. It is well to stamp the various sizes on the face of the jig as well as the tops of the pins to corresponding size in the sketch.

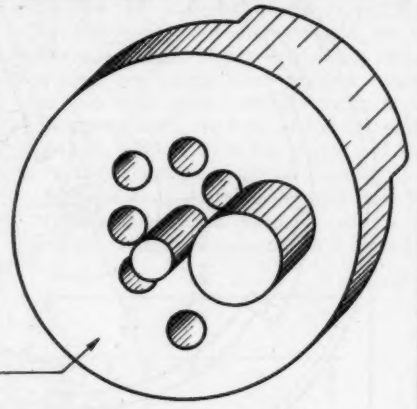
NONSAGGING TOWEL HOLDER

S. H. Puehler, Public Schools, Milwaukee, Wisconsin

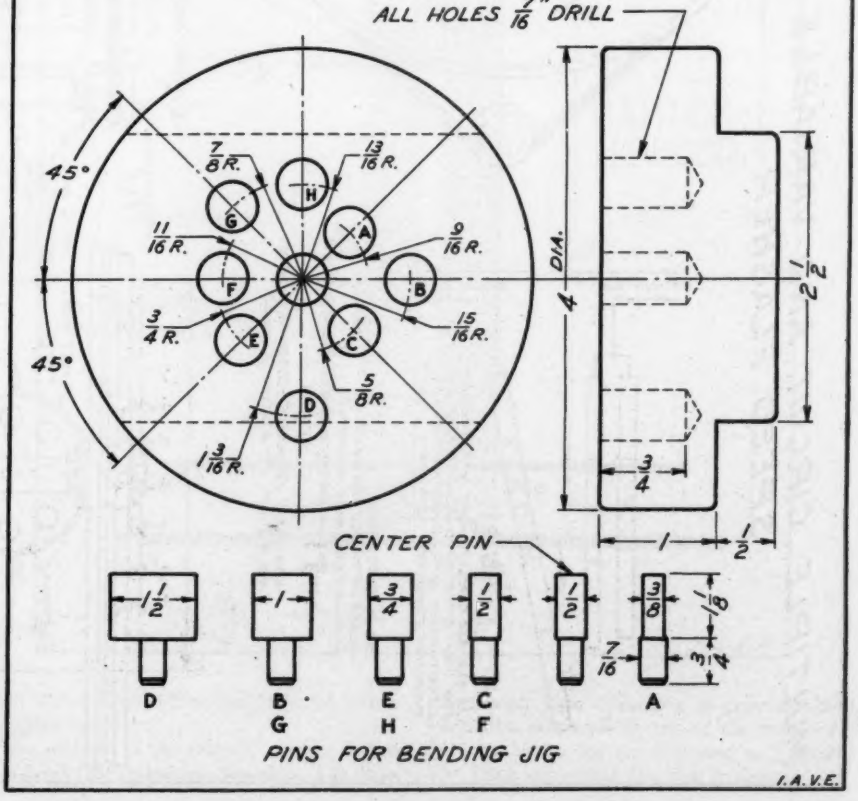
To correct the sagging condition of the majority of the towel holders found in most households, the following holder was constructed. Notice the 2-in. bearing surface, a feature which is lacking in most towel holders.

Should any sagging condition ever appear, it may be corrected easily by removing the

FOR BENDING SCROLLS		
POSITION	PIN DIA.	THICKNESS OF METAL
A	⅜	⅛
B	1	3/16
C	½	⅛
D	1½	3/16
E	¾	⅛
F	½	3/16
G	1	⅛
H	¾	3/16

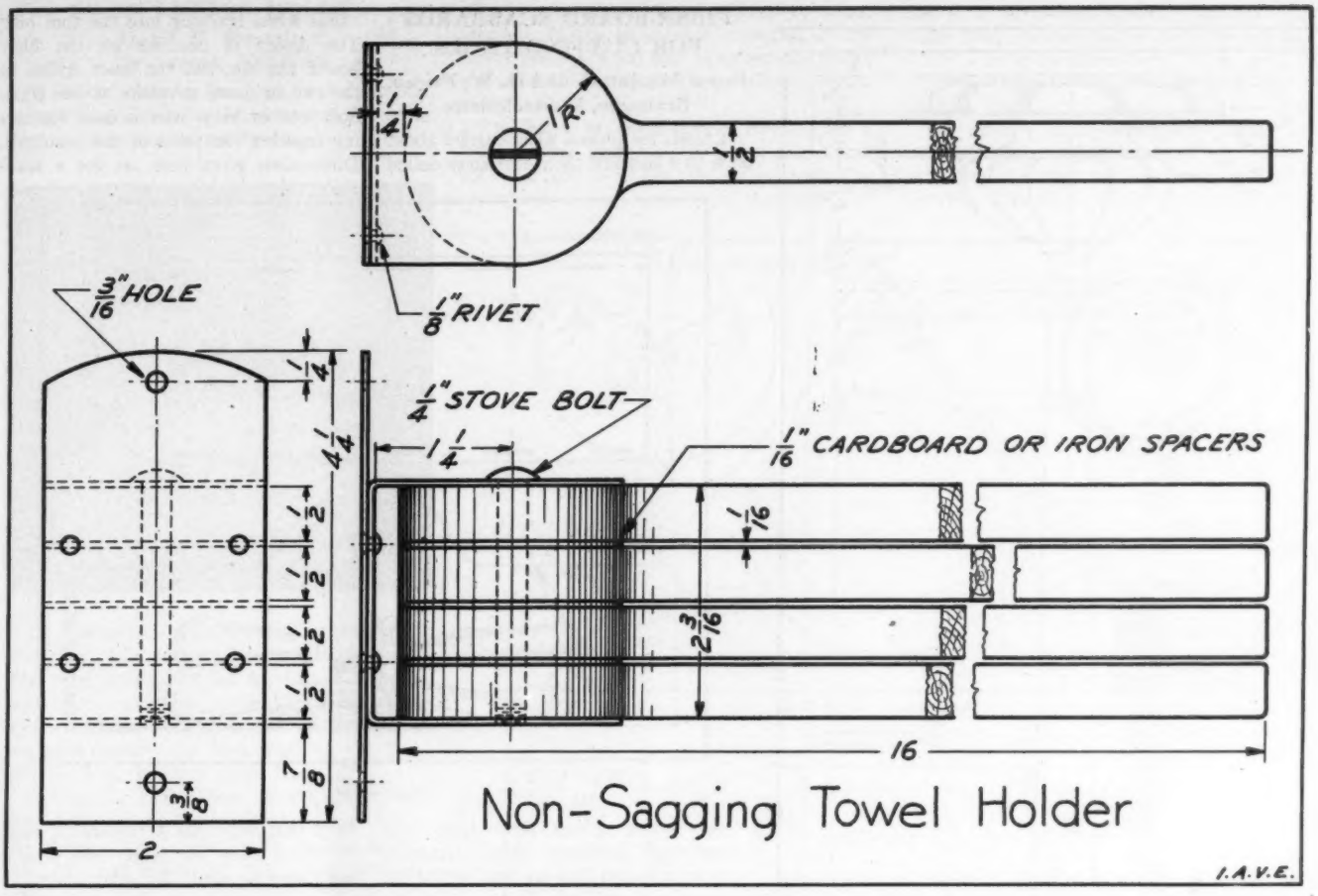


JIG SET FOR BENDING SCROLL OF 3/16" STOCK OVER A 1" CORE



PINS FOR BENDING JIG

I.A.V.E.



bolt and turning any warped arm upside down, after which the bolt is replaced. Any degree of tightness on all the arms may be had by a turn or two of the bolt.

This towel holder also fills the need of a combination metal-wood project so desirable in a general shop.

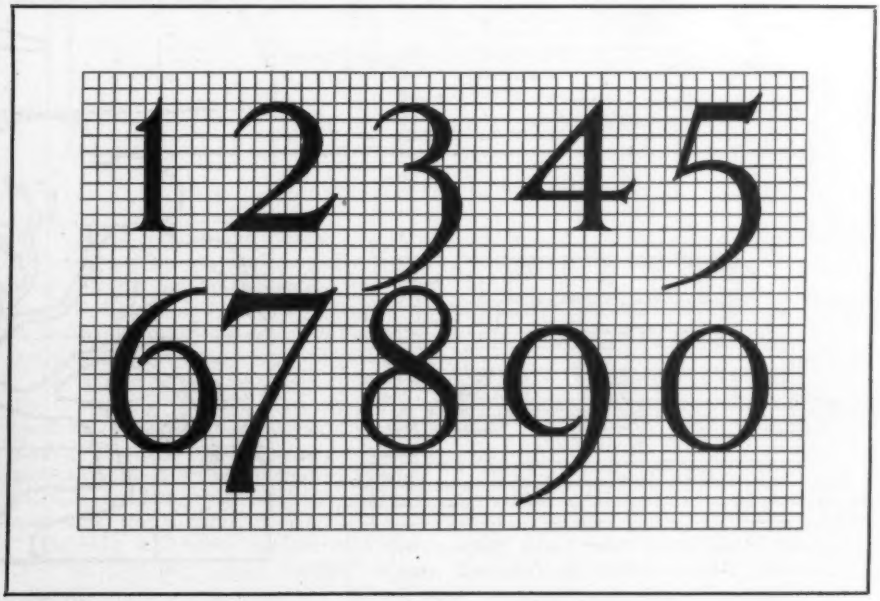
METAL RESIDENCE NUMBERS

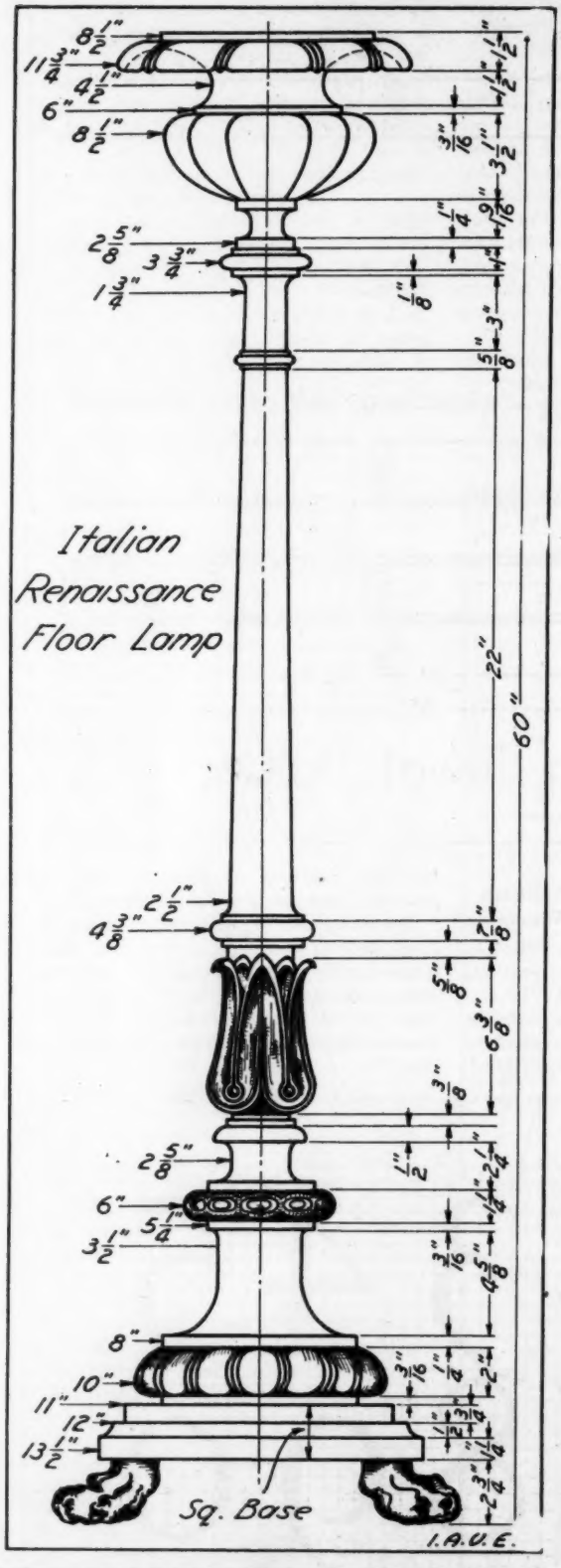
Robert A. Harris, Green Bay, Wisconsin

The metal residence numbers described in this article make an interesting and practical project for a class in metalworking. The material used is inexpensive and may often be salvaged from the scrap pile. The numbers may be made any size to suit the individual, but those laid out on 3/8-in. squares have proved the most suitable for the average home.

The construction entails laying out, cutting, filing, drilling, and peening. A suitable finish is obtained by applying a coat of black enamel and sanding lightly when dry to bring out the high lights. A coat or two of clear lacquer or varnish will prevent the high lights from rusting.

Metal residence numbers



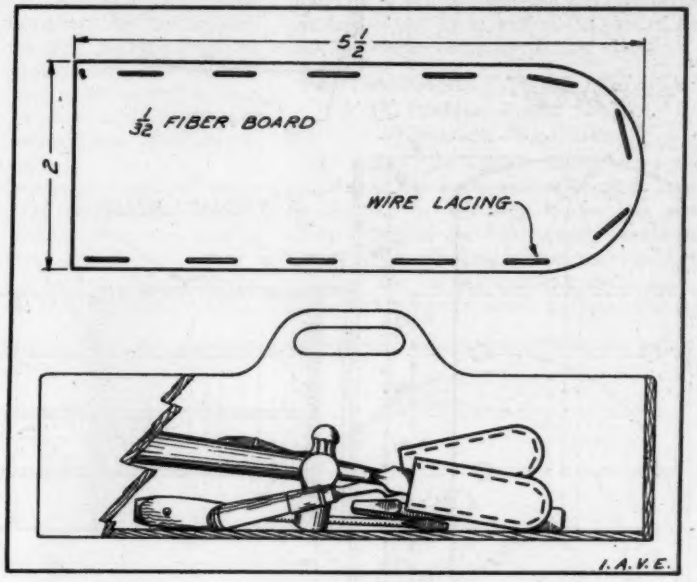


Italian Renaissance Floor Lamp designed by Reinhold Forkel, School of Industrial Arts, Trenton, New Jersey

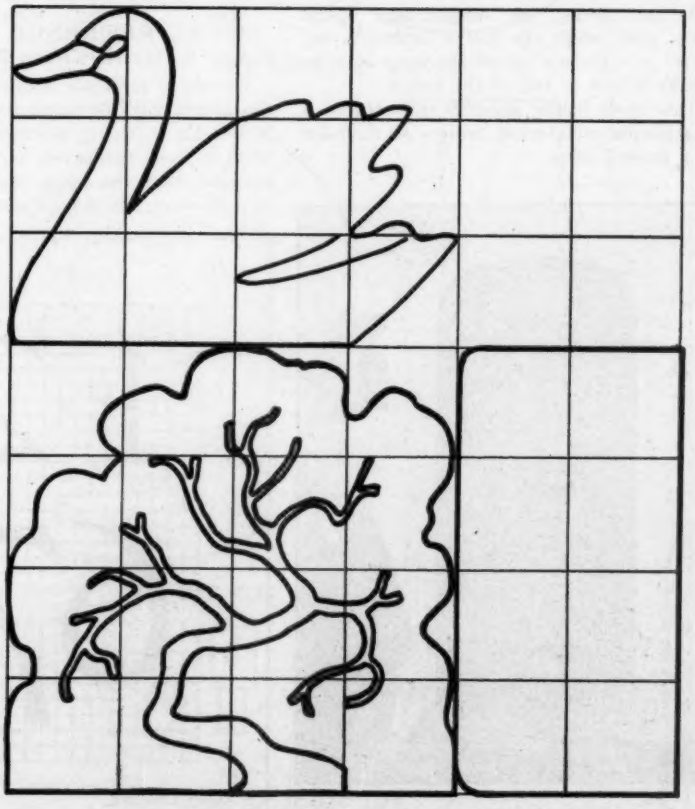
FIBER-BOARD SCABBARDS FOR CUTTING TOOLS

Bruce MacIntosh and D. W. Prince, Braintree, Massachusetts

Chisels are nicked when carried about in a tool box and their sharpness dulled from jarring against other tools. The fiber-board scabbards shown eliminate this trouble and also prevent cutting the hands when reaching into the tool box. The design is penciled on the fiber board, cut out, and the holes drilled in the two or more members at one time. Soft iron or brass wire is used for lacing together the parts of the scabbard. Dimensions given here are for a scabbard that will take a reasonable range of chisel sizes but larger and smaller ones may be made for other sizes.



Chisel scabbards



Details of the swan letter holder

SWAN LETTER HOLDER

Hazel F. Showalter,
Davenport, Nebraska

A letter holder in the form of a swan and a green bush makes a pleasant project in color for the beginner in woodwork.

Few directions are needed. The pattern is laid off in 1-in. squares for easy enlargement. The base is of ¼-in. stock, and the two upright pieces of ⅛-in. stock. Fasten the three pieces together with glue and brads, placing the bush against the back edge of the base and perching the swan on its front edge.

Enamel the swan white, using black for its bill, eyes, and the marks for the wings. Make the bush light green with orange-brown branches, and make the water pale greenish blue.

MODERNISTIC COPPER-TRIMMED LAMP

S. H. Puehler, Public Schools,
Milwaukee, Wisconsin

The lamp described herewith fills the need for a desirable wood-turning project. Its appearance of squattiness adds an air of distinction to most any present-day setting of furniture. From its design, one can see it is primarily intended for decorative purposes or for a night lamp, where a subdued light is desired. This project may be made of any of the finer cabinet woods, such as walnut, mahogany, maple, or birch.

The lamp may be made of one solid block of wood or separate pieces may be glued together. In the latter case, a section of the center piece of wood may be sawed out before gluing to allow room for the installation of the switch and socket.

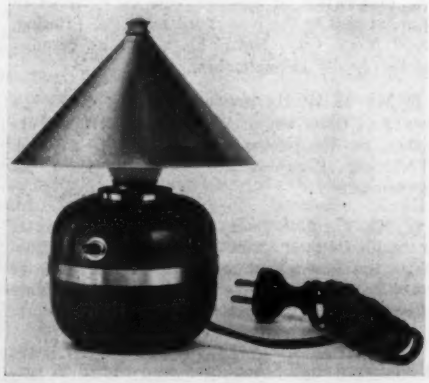
The block of wood first is chucked on a faceplate and turned to the given size, allowing for a tight fit of the two copper rings. The socket hole is next drilled and then the holes for the wire entrance and switch.

If no provision was made in gluing up the block for the switch and socket, then the upper half of the inside of the cylinder must be turned out to provide space for the installation of these parts and wire connections.

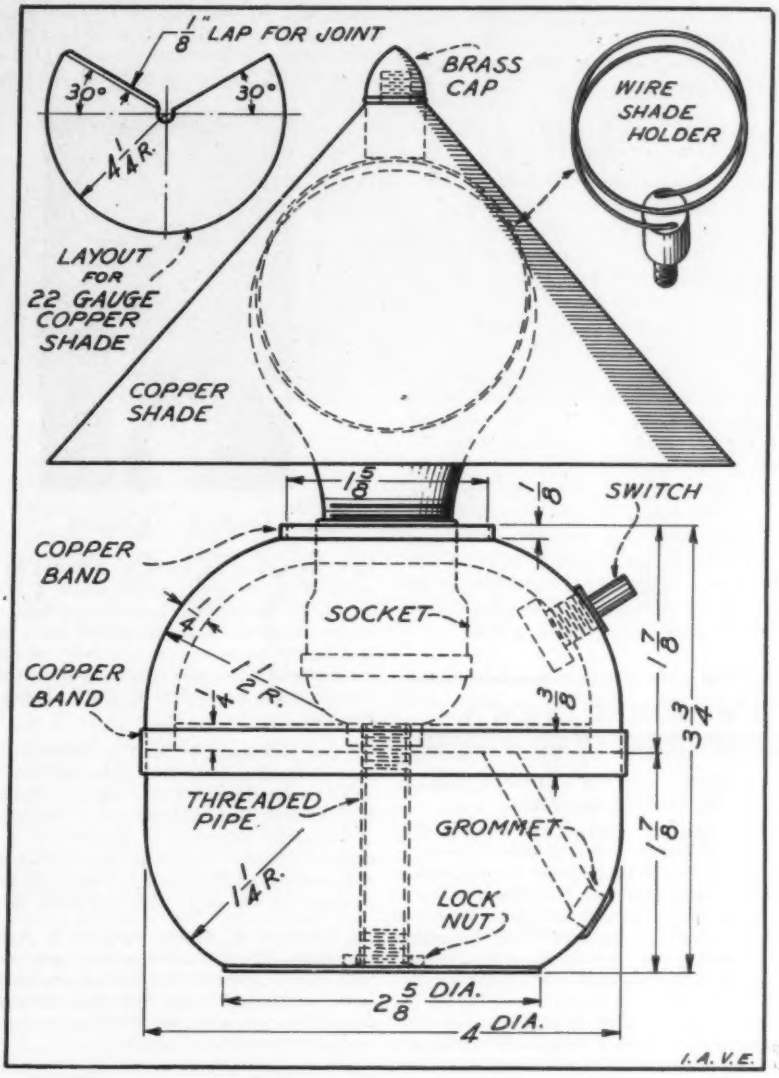
The entire lamp may be completed while on the lathe and a desirable finish applied. The finish may consist of the selected stain, filler, shellac, oil, or wax. After the faceplate is removed, a hole is drilled up from the bottom to allow for a threaded connection which is needed to hold the socket in place.

The bulb wire holder consists of a short piece of ½-in. round metal threaded on one end so as to permit screwing into the cap. Three slots are filed in the opposite end into which a piece of spring wire, 14 in. long, is soldered after having been formed into a circle.

The shade is made of 20-gauge copper according to the template shown. A soldered lap seam is used to hold the two edges together. The shade should be cleaned thoroughly, and lacquer, varnish, or wax applied to preserve the finish.



Modernistic copper-trimmed lamp



Details of copper-trimmed lamp

Answers to Questions

PASTE WOOD FILLER

1038. Q.: I would like to have a good formula for paste wood filler which will stand up under lacquer. — *J. L. C.*

A.: For a filler under lacquer or varnish:
10 oz. boiled linseed oil

2 oz. 4-hr. type varnish
4 oz. turpentine Japan drier
4 oz. pure turpentine

Add the above to 5 lb. of silex to make a stiff dough. Reduce at the rate of 12 lb. or more per gallon of thinner made of one part pure turpentine and two parts of standard gasoline. Probably your trouble is not standing up under lacquer is insufficient drying, which should not be less than 24 hours at 75–80 deg. F. and 48 hours are better. The sealer coat should follow and should be of a type that will not bleach or react with the filler. — *Ralph G. Waring.*

REMOVING CHEWING GUM FROM FURNITURE

1047. Q.: I have been called upon to remove chewing gum from the writing board of a highly varnished walnut writing desk. The gum has been in place a long time and is surely tight. How may I remove it without damaging the finish? — *A. M. E.*

A.: Chewing gum is readily soluble in ordinary gasoline. For this reason the bulk of the chunk of dried gum should be carefully pared off with a sharp knife almost to the wood; the remainder may then be taken off with a rag saturated with gasoline. After the removal is complete, the spot may then be rubbed with felt, FFF pumice, and crude oil. A piece of waste may be lightly squeezed out of water and then used to rub out the gum area and later the entire surface in order that the sheen may be uniform throughout. If desired, clean up the entire job of cabinetwork with a good polish. — *Ralph G. Waring.*

Personal News

THE PASSING OF AN INDUSTRIAL-ARTS PHILOSOPHER

Professor George E. McLaughlin, Head of the Department of Industrial Arts at Ohio University, Athens, Ohio, died at his home on July 15, 1938, following a rather long period of illness.

Mr. McLaughlin was born at Adena, Ohio, on February 2, 1877. He attended Ohio University and graduated in the class of 1902 with a degree in electrical engineering. He was offered an instructorship in this department, and continued in this work until 1913. Then he was commissioned to organize and establish a department of manual arts at the university. His success and leadership in this work became nationally known. The department outgrew its early quarters and in 1927, the entire second floor and part of another in Super Hall were used in the teaching of industrial arts.

Mr. McLaughlin was one of the founders of industrial arts and was a recognized leader in this field. He was a member of the Western Arts Association since its inception, and never missed a meeting until his recent sickness. He was elected to membership in the Epsilon Pi Tau honorary fraternity and became its sponsor at Ohio University.

The death of Professor McLaughlin is a loss not only to Ohio University but also to the many students who mourn his passing. As a teacher, "Mac" was beloved for his qualities of sympathetic understanding. He was never too busy to listen to his students' problems, and aided them as a father and counsellor. He gave unstintingly of his time to those boys who found their college education beset with difficulties. He was an earnest friend to the underprivileged lads, many of whom he helped financially, and showed a particular interest in farm boys. Foreign students seemed to gravitate to Mr. McLaughlin's office for advice and help. His interest in his boys continued beyond graduation, and many of his students sought his counsel and suggestions for years.

Professor McLaughlin is revered by his associates for his valuable service in the field of education, and by his students for his thorough ability as a teacher. He is beloved by all for his kind and sympathetic understanding of human problems and for his untiring and unselfish de-

George E. McLaughlin

votion to a cause for which he dedicated his life's work. His philosophy on life sought a brighter day on the morrow and radiated and inspired his students to greater achievement. He was a builder of men, and his monument is a living memory in the minds of those with whom he associated and whom he inspired. — *Earl E. Smith, Leonard B. Voorhees.*

¶ Dr. Lawrence F. Ashley, formerly chairman of the Department of Industrial Arts Education in the State Teachers College, Charleston, Ill., has been appointed director of the Division of Vocational Education in Yonkers, N. Y. This division embraces industrial arts, special, adult, and vocational education. Dr. Ashley received his doctorate at the Ohio State University in 1936.

¶ Kenneth W. Brown, formerly in charge of the Grove City, Ohio, development program has been made a professor of industrial-arts education in the Ball State Teachers College at Muncie, Ind. Mr. Brown has now matriculated for the doctorate at Ohio State University.

¶ Professor Everett G. Livingston, of the industrial-arts staff in the State College at Ames, Iowa, has been made chairman of the Department of Industrial Arts Education in the South Georgia Teachers College at Collegeboro. Professor Livingston has completed a year's work on his doctorate at the Ohio State University.

¶ Victor L. Bowers, an industrial-arts teacher in the Union Grove High School at Gladewater, Tex., and formerly president of the Eastern Texas Industrial Arts Association, as well as vice-president of the Texas Vocational Association, will substitute next year for Professor William D. Stoner on the industrial-arts faculty at Miami University, Oxford, Ohio. Mr. Bowers received his master's degree from the Ohio State University in 1937.

¶ Dr. E. W. Bollinger, Department of Vocational Education, State Department of Education, Albany, N. Y., was a member of the summer-session staff of the Ohio State University, Columbus, Ohio, during the past summer.

¶ Maris M. Proffitt, Educational Consultant and Specialist in Guidance and Industrial Education, Federal Office of Education, Washington, D. C., was on the summer-session faculty of the Ohio State University, Columbus, Ohio, during the past summer.

¶ Elmer W. Christy, Director Industrial Arts, Cincinnati Public Schools, Cincinnati, Ohio, served on the faculty of the Ohio State University, Columbus, Ohio, during the latter part of the first term of the past summer-school session.

¶ Mr. Perry Fite of Technical High School, Dallas, Tex., was a guest instructor in the Industrial Education Department of East Texas State Teachers College at Commerce, Tex., during the 1938 summer session. Mr. Fite received his B.S. degree from East Texas State College and his M.S. degree from the Texas A & M College.

¶ Mr. E. L. Biledeaux, formerly of Technical High School, Fort Worth, Tex., has been appointed district supervisor of trade and industrial education in Northeast Texas to succeed Mr. Coalgate Elmer who resigned to accept a position in the schools at Gladewater, Tex.

¶ James O. Stephan, an industrial-arts teacher in the high school at Groveport, Ohio, and a member of the Franklin County Committee on industrial arts, and formerly secretary of the West Virginia Industrial Arts Association, has been appointed to an instructorship in industrial-arts education in Ohio University at Athens. Mr. Stephan obtained his master's degree in industrial-arts education from the Ohio State University in 1936.

¶ Professor George H. Spearman of the State College at San Jose, Calif., has accepted an assistantship in industrial-arts education at the Ohio State University in order to work toward his doctorate. Professor Spearman obtained his master's degree from Stanford.

¶ Delbert P. Nave, an industrial-arts teacher in the high school at Parma, Ohio, goes this year to the State Teachers College at Millersville, Pa., to accept an instructorship in industrial-arts education and to serve as assistant dean of men.

¶ Mr. Walter A. Klehm has been appointed acting head of the industrial-arts department at the Eastern Illinois State Teachers College, Charleston, Ill.

¶ Edward N. Whittington has assumed duties as vice-principal at the West Carthage High School, West Carthage, N. Y.

¶ Mr. Frank Di Giacomo who has accepted an appointment to the New York School of Printing, New York City, began his duties as member of the faculty in September.

¶ Mr. M. W. Haynes has been engaged by the board of education of Wilmington, Dela., to organize the courses that will be given in the new Technical High School which opened in September.

¶ Mr. C. H. Bonsack, for the past 13 years a Smith-Hughes agriculture teacher at Oregon, Wis., has been appointed assistant supervisor of vocational agriculture education with the state department of vocational education.

¶ Mr. Harold Morrisey, formerly at the Highland, Wis., High School, has been named to succeed Mr. C. H. Bonsack, as teacher of agriculture at Oregon, Wis.

¶ JOHN R. LUDINGTON, Professor Industrial-Arts Education, Ball State Teachers College, Muncie, Ind., had charge of the graduate program at Northwestern University during the summer-school session.

¶ DR. LAWRENCE F. ASHLEY, Eastern Illinois State Teachers College, Charleston, Ill., had charge of the summer-school graduate work at Iowa State College, Ames, Iowa, during the absence of Professor William L. Hunter.

¶ G. O. WILBER, State Normal School, Oswego, N. Y., had charge of the summer program at Ohio University, Athens, Ohio, in the absence of Professor McLaughlin.

¶ WALTER R. WILLIAMS, Arts and Industries Building, Oberlin, Ohio, has been appointed to succeed Kenneth W. Brown.

¶ With the beginning of the new school year, MR. E. R. BILEDEAUX of Fort Worth, Tex., has assumed his new duties as district supervisor of trade and industrial education in Tyler, Tex., replacing Mr. Colgate Elmer of Kilgore, Tex.

Graduate class, summer session, 1938, Iowa State College, Ames, Iowa. Top row: *Streyfeler, Hollar, Perkins, Harris, Hall, Benz, Burkhiser, Nieman, Peavler, Peoples, Stone, Steinhoff.* 2nd row: *Lindstrom, Hoeman, Carr, Smith, Waltrip, Thomas, Beck, Thompson, Scott, Kingery, Sissel.* 3rd row: *Martens, Craft, Meuler, Amsden, Corbin, Claude, Seaver, Adams, Bivans, Korn, Thorson, Kroll, Bienert.* 4th row: *Davis, Snook, Jenkins, Aspenson, Wahtera, Lerdal, Parker, Sherman W, Berry, Alspach, Pease, Kranzusch.* 5th row: *Holmes, Wise, McAllister, Schmidt, Ashley, Livingston, Heldreth, Sherman A, Hill, Wick*

Association News

¶ The National Student Graphic Arts Society's 17th Annual Conference on Printing Education was held at Washington, D. C., June 29 to July 2, 1938.

On Wednesday morning, June 29, the officers of the National Graphic Arts Education Guild held their annual meeting.

On Thursday morning, June 30, the opening session was held, with Harold G. Crankshaw, President of the Guild, as chairman. This, as well as all other meetings, was well attended.

"The Printing Business — Its Opportunities and Needs" was the title of a talk given by George R. Keller, Washington Manager of the American Type Founders Sales Corporation. Mr. Fred W. Hoch, Supervisor of Production Management, United Typothetae of America, spoke on "New Things in Printing." Mr. George Welp, International Printing Ink Corporation, New York City, spoke on "The 1938 Tileston and Hollingsworth Calendar." An inspection visit to the U. S. Government Printing Office was conducted in the afternoon.

At the general session Friday morning, July 1, Professor Glen U. Cleeton, Head, Department of Printing, Carnegie Institute of Technology, Pittsburgh, Pa., was the chairman. The theme of this meeting was "Research in Graphic Arts Education." The following addresses were delivered: "Functional Validation of the Printing Curriculum" by R. Randolph Karch, Technical Supervisor, Rochester Athenaeum and Mechanics Institute, Rochester, N. Y.; "Intaglio Printing — History, Technique, and Its Possibilities in the School Graphic Arts Laboratory — A Research Summary," by Anthony Marinaccio, Henry Barnard Junior High School, Hartford, Conn. "Printing — Its Effect Upon Reading, Spelling, and Visual Perception," A Study Conducted at a Vocational School for Boys, by Henry Hansberg, New York City; Research Highlights on the 1938 Research Projects of the National Graphic Arts Education Guild were presented as follows: "Junior-High-School Study," by Frank Di Giacomo, Boody Junior High School, Brooklyn, N. Y.; "Senior-High-School Study," by Crawford Park, South High School, Youngstown, Ohio; "Vocational-Schools Study," by Ferdy J. Tagle, The New York School of Printing, New York City; "College Study," by John C. Tranbarger, Assistant Professor Industrial Arts, Indiana State Teachers College, Terre Haute, Ind.

Research clinics were also conducted. Mr. Frank Di Giacomo was the chairman of the junior-high-school group, and the discussion leaders were: George J. Bilsey, Thomas Jefferson Junior High School, Cleveland, Ohio; Edward W. Kurtz, Jefferson Intermediate School, Detroit, Mich.; Hubert A. Slater, Central Junior High School, East Providence, R. I.

Mr. Crawford Park was chairman of the senior-high-school group, for which the discussion leaders were: Joseph B. Coyle, Johnstown High School, Johnstown, Pa.; Leonard A. Petersen, West High School, Green Bay, Wis.; William P. Grady, Hyde Park High School, Boston, Mass.; Edward C. Estabrook, Maury High School, Norfolk, Va.; Edward S. French, Woodrow Wilson High School, Washington, D. C.

Mr. Ferdy J. Tagle was chairman of the vocational-school-study group, with the following discussion leaders: Ward W. Swain, Washington Vocational High School, Pittsburgh, Pa.; Charles F. Zinn, Camden County Vocational School, Merchantville, N. J.; Fernand Caillet, Montreal Technical School, Montreal, Quebec, Canada; Fred W. Miller, Manager Printing Department and Supervisor of Instruction, Masonic Home and School, Fort Worth, Tex. Professor John T. Tranbarger was chairman of the college group, and the discussion leaders were as follows: William R. Baker, Head Department of Printing, Stout Institute, Menomonie, Wis.; Anthony T. Stavaski, State Teachers College, California, Pa.; Leroy Brewington, Supervisor of Printing, Kansas State Teachers College, Pittsburg, Kans.; C. W. Hague, State Teachers College, Fitchburg, Mass.; Charles W. Pitkin, Carnegie Institute of Technology, Pittsburgh, Pa.

The Hon. Alvin W. Hall, Director of U. S. Bureau of Engraving was the speaker at the Friday luncheon, after which a very interesting tour of inspection was made through the Bureau of Engraving.

At a special evening session, Mr. Sol Hess, the well-known type designer of the Monotype Corporation, presented thirty questions on the various phases of type making and type uses to the teachers. The discussion of these questions made the session exceedingly interesting and educational.

The annual dinner meeting was presided over by Harold G. Crankshaw, President, The National Graphic Arts Education Guild. J. Henry Holloway, Principal, The New York School of Printing, New York City, was the toastmaster. The speakers and their subjects were as follows: Hon. James J. Davis, U. S. Senator from Pennsylvania, "Education for Industry"; Dr. L. H. Dennis, Executive Secretary, American Vocational Association, "Progress in Practical Arts and Vocational Education"; Dr. Chester Holmes, Assistant Superintendent, Public Schools of Washington, D. C., "The Place of the Graphic Arts in the Public School"; Elmer J. Koch, Secretary, United Typothetae of America, "The Printing Industry"; Clark R. Long, President, International Association of Printing House Craftsmen, "Adult Vocational Education in the Printing Industry"; Harry L. Gage, Vice-President, Mergenthaler Linotype Company, "Progress in Graphic Arts Education."

Then followed the awarding of the trophy cup and prizes to the winners of the Scrapbook Contest. Three first prizes were given besides a grand award of a large silver loving cup.

Vocational or trade level. First prize: The NYSP Fotografy Klub, New York School of Printing, New York, Thomas S. Hiller, Sponsor. One-year subscription to INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, presented by Editor, John J. Metz. Second prize: Paso Del Norte Student Graphic Arts Society, El Paso, Vocational School, El Paso, Tex., William Van Gasbeek, sponsor.

Senior-high-school level. First prize: Lew Wallace Pica Club, Lew Wallace High School, Gary, Ind., J. J. Dreven, sponsor. One copy of *Newspaper Makeup*, donated by Harper and Brothers, New York City.

Junior-high-school level. First prize: The Franklin Printers Club, J. C. Murphy Junior High School, Atlanta, Ga., E. V. Harris, sponsor. One-year subscription to INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, presented by Editor, John J. Metz. Also the grand award of a silver loving cup donated by the American Type Founders, Elizabeth, N. J., and presented by President Thomas R. Jones. The cup is to become the permanent property of the student honor club who wins it twice. Second prize: The Langley Printers Club, Langley Junior High School, Washington, D. C., Harold H. Kirk, sponsor, and chairman of the National Student Graphic Arts Society.

The following were elected as officers for the coming year: President, Ferdy J. Tagle; vice-president, C. Harold Lauck; secretary, William R. Baker; treasurer, Harold E. Sanger.

New York City was selected for the 1939 convention city, the date to be selected by the officers and board of directors.

¶ The Pennsylvania Vocational Association and the Department of Public Instruction of the Commonwealth of Pennsylvania held their twenty-fifth annual conference, June 23–25, at Penn Hall and Wilson College, Chambersburg, Pa.

Among the conference groups represented were: Agricultural education, home-economics education, vocational-industrial and industrial-arts education, civilian rehabilitation and distributive occupations.

Many men and women of wide reputation participated. Space does not permit a listing of all of them, but a few representative ones are: Lester K. Ade, Superintendent of Public Instruction; C. E. Ackley, Deputy Superintendent; Paul L. Cressman, Director of the Bureau of Instruction; A. C. Fetteroff, Chief of Agricultural Education; Walter B. Jones, Chief of Industrial Education; Mrs. Anna G. Green, Chief of Home-Economics Education, all from the State Department of Public Instruction. Prominent persons from outside the state include: L. H. Dennis, Executive Secretary, American Vocational Association, Washington, D. C.; Ray Heim, State Director of Vocational Education, Delaware. The State Council of Education was represented by Marion K. McKay. Among the teacher-training group were: William C. Ash, Director of Vocational Teacher Education, University of Pennsylvania, and Anthony M. Goldberger, Acting Director of Vocational Teacher Education, University of Pittsburgh.

Helen Rishel Swank presided in her capacity as president of the Pennsylvania Vocational Association; S. L. Coover, Secretary-Treasurer, rendered effective service as registrar of the meeting.

Approximately 600 members registered and many more visitors attended the meetings. The main floor of the gymnasium of Penn Hall was given over to exhibits. This was an interesting and educative feature of the convention. Many firms handling educational materials, supplies, and equipment were represented. Another interesting part of the program was "The Ship" handled by representatives of companies exhibiting.

In the general meeting, Millard B. King, formerly expert in industrial education, talked on "Teaching the Baby to Walk." L. H. Dennis chose as his topic "A Quarter Century of Vocational Education." Marion K. McKay spoke on "The Forward Look in Vocational Education." Robert L. Sutherland of Bucknell University gave an interesting talk on "Problems Facing Youth Today."

Henry Brunner, Head of the Department of Rural Education, The Pennsylvania State College, led the music at the general meeting and at some of the departmental meetings. The following officers were elected: President, Ray Cole, County Supervisor of Agriculture, Bloomsburg; vice-presidents, Helen Rishel Swank, County Supervisor of Home Economics, Lebanon; Helen A. Mackey, County Supervisor of Home Economics, Norristown; Wayne B. Rentschler, Teacher Vocational Agriculture, Lampeter; Paul W. Memmert, Director of Vocational Education, Bethlehem; secretary-treasurer, Dr. F. Theodore Struck, Head, Department Industrial Education, Pennsylvania State College, State College: editor *P.V.A. News*, J. G. Allen, Soldiers' Orphan School, Scotland; assistant editor *P.V.A. News*, Clyde H. Pensinger, Soldiers' Orphan School, Scotland.

¶ At the final spring meeting the members of the Southeastern Industrial Arts Club of New York met at the Warwick High School. The following officers were elected to serve next year: President, Kenneth Souva, Spring Valley; vice-president, Leland Whiting, Newburgh; secretary, Harold MacDonald, Cornwall; treasurer, Lynwood Sinnamon, Newburgh; chairman of program committee, Gurdon Jones, Newburgh.

The first fall meeting will be held October 4, in the new North Junior High School, Newburgh, N. Y.

¶ The third annual drawing conference sponsored by the Department of Engineering Drawing, Ames, Iowa, was held May 13–14, 1938. From 8 to 12 a.m., on Friday, May 13, the ranking and placement of high-school and junior-college competitive drawings took place. Professor F. M. McGaw, Cornell College; Professor R. E. Roudebush, Iowa State College; Professor H. G. Palmer, Iowa State Teachers College, were the judges.

Registration for the conference took place Friday from 1 to 6 p.m. At the annual dinner at 6:30 p.m., Professor William L. Hunter, Head, Industrial Arts Department, Iowa State College, was master of ceremonies. After the dinner, the displays in the engineering drawing room were visited. At the meeting Saturday morning at 8 p.m., Robert Henning, Burlington, Iowa, was chairman and addresses were given by Dr. Clair V. Mann, Missouri School of Mines, Rolla, Mo.; Dr. J. E. Evans, Head, Department of Psychology, Iowa State College.

At the general assembly, at 9:15 a.m., W. B. Galloway, Dubuque, Iowa, was chairman. At this meeting the question "Can a Course in High-School Drawing Be Standardized so that Each High School Will Cover the Same Ground?" was discussed. Mr. R. M. Hammes, Council Bluffs, Iowa, was chairman during the discussion of "The Objectives of Mechanical Drawing in a High School." From 12 until 1 o'clock a set of high-grade drawing instruments was competed for by a number of teachers of mechanical drawing who tried to give one-minute discussions on the "Educational Benefits Derived from a Course in Mechanical Drawing." The winner was determined by balloting.

Saturday at 1 o'clock, the announcements of the winners in the high-school junior-college competition were made.

This drawing competition is open to any student enrolled in an Iowa high school or junior college. The competition is divided into the following classes:

Class A — Junior-high students who have had only one semester of drawing.
Class B — Junior-high students who have had two or more semesters of drawing.
Class C — Senior-high students who have had only one semester of drawing.
Class D — Senior-high students who have had two or more semesters of drawing.
Class E — Junior-college students who have had only one semester of drawing.
Class F — Junior-college students who have had two or more semesters of drawing.

¶ The Nebraska Industrial Arts Teachers Association met in Lincoln, Nebr., March 25–26. This Association meets annually with the Departments of Superintendents and Principals and the Elementary Principals. Dr. A. W. Clevenger of the University of Illinois was the guest speaker at both the general sessions and the department meetings.

Nebraska industrial-arts teachers have been working on course of study outlines for a Nebraska course of study for industrial arts. Under the leadership of Walter A. Klehm, Eastern Illinois State Teachers College, fourteen subject-matter committees are compiling outlines for the many phases of industrial arts being taught in Nebraska's schools. The new Nebraska certification law was explained to the industrial-arts men and it was pointed out that under this law industrial-arts teachers must hold a secondary-school certificate which requires the holder to have a baccalaureate degree. Renewal of these certificates requires an additional nine semester hours of graduate work, two hours of which must be in education. This ruling will definitely raise the standards of industrial-arts work in Nebraska.

The officers elected for next year are: President, W. E. Clark of Columbus; vice-president, C. J. Orness of Lincoln; secretary-treasurer, Otto Olsen of Kearney. The district trustees are: A. H. Miller, Lincoln; Wm. Hepfinger, Blair; E. J. Huntemer, Wayne; G. F. Rost, Grand Island; G. Y. Conley, Holdrege; L. Salsow, Alliance. — *Wm. W. Little.*

¶ The Western Washington Association for Industrial Education held its semiannual meeting in the Senior High School of Ellensburg, Wash., on Saturday, May 7, 1938. The meeting was called to order at 9:30 a.m. by Mr. Howard E. Wilder, of Ellensburg. An address of welcome was given by a member of the Ellensburg chamber of commerce. The first speaker was Mr. Herbert C. Ruckmick of the Western Washington College of Education, Bellingham, Washington. Mr. Peter Tjossem, of Ellensburg gave a very interesting talk on "Hobbies and the Industrial Arts." Following a short business meeting, the morning program was closed with a talk by Mr. E. L. Breckner, Washington State Planning Council, Olympia, Wash., on "The Future of Industrial Education in the State of Washington." Luncheon was served to about 75 members and their families, following which Mr. Samuel E. Fleming, Assistant Superintendent of Schools, Seattle, Wash., spoke on "The National Trends in Industrial Education." During the afternoon an excursion was made to the Ginkgo Petrified Forest, near Ellensburg, and on Sunday another excursion was made to Grand Coulee Dam. — *A. H. Drews.*

¶ The Western Illinois Industrial Arts Round Table held its last meeting of the year on Wednesday, May 4, at the High School, Sherrard, Ill. Fred N. Stark, Sherrard industrial-arts teacher

(Continued on page 16A)

AFTER 7 YEARS' WORK

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Yes—After seven years of patient unremitting experimental work, building and testing model after model, eliminating "bugs" and weaknesses in existing tilting arbor designs, creating and developing basically new designs — Delta engineers are pleased to announce a really *perfect* tilting arbor saw with *none* of the flaws of existing designs—a saw that offers numerous exclusive advantages and an operating efficiency never before attained! A few of its high points include:

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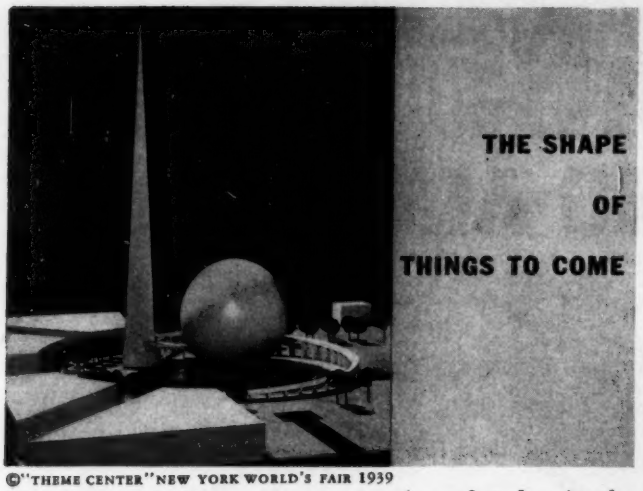

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(Continued from page 364)

and principal, presided. Allen C. Tyler, vocational instructor of the Spring Valley High School, and vice-president of the trades and industries section of the Illinois Vocational Association delivered the main address. Other speakers of the evening were Dr. Claude Vick and William H. Molvey both of the Illinois State Vocational Department.

Members of the Mercer County School Masters Club were guests, with representatives from most western Illinois schools. Dinner was served to 150 persons by the Sherrard Woman's Club.

Cadets of the Roosevelt Military Academy of Aledo, Ill., furnished music for the occasion.

The following officers were elected for the next year: E. W. Freeman, president, Moline, Ill.; George C. Rausch, vice-president, Rock Island, Ill.; Louis L. Josserand, secretary-treasurer, East Moline, Ill.; F. N. Stark, assistant secretary-treasurer, Sherrard, Ill.

¶ The Southwest Iowa Teachers Association convention will be held at Council Bluffs, Iowa, October 13–14.

At this convention, Dr. William E. Warner will deliver four addresses. Thursday at 2 p.m., he will speak on "The Secondary School Becomes a Laboratory for Living." At the industrial-arts banquet at 6 p.m., his subject will be "The Nature and Scope of Industrial Arts in the American Program of Education."

At the general assembly on Friday, October 14, he will speak on "The American People and Their Educational Investment" and at the high-school forum at 2 p.m., he will speak on the subject "Techniques of Projection and Appraisal in the Evolving Secondary School."

¶ The Iowa Association of Industrial Arts Teachers will hold its convention on November 2–5, at Des Moines, Iowa. The president of this organization is H. G. Palmer, Iowa State Teachers College, Cedar Falls, Iowa, and the secretary is C. J. Schollenberger, Roosevelt High School, Des Moines, Iowa.

¶ The Iowa Vocational Association will hold its convention on November 3, at Des Moines, Iowa. The president is W. B. Galloway, Industrial Arts Department, Dubuque, Iowa, and the secretary is Mary Farris, State House, Des Moines, Iowa.

¶ The Wisconsin Industrial-Arts Association will hold its convention November 3–5 at Milwaukee, Wis. The president is Leo R. Ebben, Kohler, Wis., and the secretary is Roy R. Van Duzee, Supervisor Industrial Arts, West Allis, Wis.

¶ The Kansas Vocational Teachers Association will hold its convention November 4–5 at Topeka, Kans. The president is R. H. Roberts, Winfield, Kans., and the secretary is W. W. Scott, 1180 Brooks, Topeka, Kans.

¶ The Virginia Vocational Association will hold its convention November 25, at Richmond, Va. The president is H. Clay Houchens, School Board Office, Richmond, Va., and the secretary is Dowell J. Howard, Winchester, Va.

¶ The Massachusetts Industrial Education Society will hold its convention October 21–22, at Fitchburg, Mass. The president is Herman A. Pohlman, Newtonville, Mass., and the secretary is Daniel J. Sullivan, West Roxbury, Mass.

At this meeting, Dr. William E. Warner will speak on the subjects "The Nature and Scope of Industrial Arts in the American Program of Education," and "A Descriptive Analysis of Several New Developments in Industrial-Arts Education." His address at the Epsilon Pi Tau banquet on Saturday evening held in connection with this convention will be "The Contributions of Epsilon Pi Tau to the American Program of Industrial-Arts Education."

¶ The New England Industrial Arts Teachers Association will hold its convention November 4–5, at New Haven, Conn. The president is Morris P. Cates, Portland, Me., and the secretary is Willis B. Anthony, Fitchburg, Mass.

New Publications

Elements of Electricity

By William Esty, S.B., M.A.; Robert Andrews Millikan, Ph.D., Sc.D., LL.D., and Wynne L. McDougal. Cloth, 248 pages, 5¾ by 8½, illustrated. Price, $2. Published by the American Technical Society, Chicago, Ill.

A book in which a number of scientists and teachers of electricity have collaborated with the intention of producing a simple text for the beginner. The subjects of magnetism, current electricity, elementary series and parallel circuits, aligned circuits, induced circuits, transformers, and storage batteries, are all covered in this book.

Principles of Radio

By Keith Henny. Cloth, 496 pages, 5½ by 7⅞, illustrated. Price, $3.50. Published by John Wiley and Sons, Inc., New York City.

This is the third edition of a widely accepted book on radio work. Information, circuits, and devices recently developed in the radio field have been added. A chapter on facsimile and television transmission, useful tables on tube characteristics and the like, also have been embodied in the new edition.

Men, Women, and Jobs

By Donald G. Paterson and John G. Darley. Cloth, 6 by 9¼, 145 pages, illustrated. Price, trade

(Continued on page 18A)

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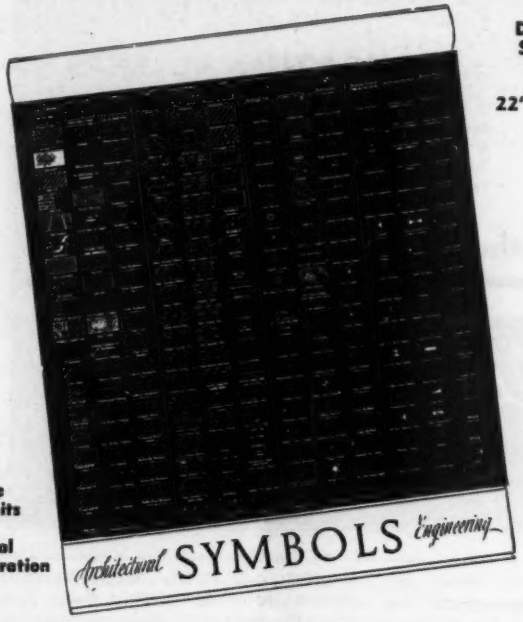

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This book is designed for elementary technical and manual training schools which find the usual books in elementary mechanics too theoretical or too mathematical for their needs, and which require a more complete and practical course than that furnished by a textbook in general physics. The fourth edition has been thoroughly revised. Some of the changes include the rearrangement of chapters to follow a better pedagogical plan, the addition of considerable material on such topics as trusses and other structures, motion, work, energy, and the elements of heat. New problems have been included.

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Foremanship and Supervision

A Practical Handbook for Foremen, Conference Leaders and Supervisors of Vocational Education.

By FRANK CUSHMAN, Consultant in Vocationa lEducation, U. S. Office of Education, Washington, D. C.

This book deals primarily with the conference procedure as applied to certain work in the field of vocational education. Important changes in this edition include the following: (1) The discussion of the principal types of conference objectives has been clarified by means of sketches, together with some additional explanation of the supporting theory; (2) an entirely new chapter is included on the selection of chart headings for different topics and different types of problems, with a sufficient number of illustrations to make the whole subject of chart or blackboard work more easily understandable; (3) a new chapter has been added, entitled "Some Fundamental Principles of Good Supervision."

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By F. THEODORE STRUCK, Professor and Head of the Department of Industrial Education, Pennsylvania State College.

This book has been prepared as an aid to prospective teachers, to teachers in service, and to students of education in the field of industrial arts and vocational education. It represents an integration of the results of experiences in secondary schools with young people and adults interpreted in the light of philosophy of education, refinements in the art of teaching, and advances made in the sciences of education. The book offers a study of the principles, procedures, and techniques of practical arts and vocational education.

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Standardize on

(Continued from page 16A)

edition, $2; text edition, $1.50. Published by the University of Minnesota Press, Minneapolis, Minn.

A review of the studies of the Committee on Individual Diagnosis and Training of the Employment Stabilization Research Institute, University of Minnesota, describing the attempt to apply research techniques in the study of the causes of unemployment, of occupational trends, of economic and industrial procedures, and of personnel practices.

Throughout the five-year study, this committee held to three major objectives: (1) To test various methods of diagnosing the vocational aptitudes of unemployed workers; (2) to provide a cross section of the basic re-education problems of the unemployed, and (3) to demonstrate methods of re-education and industrial rehabilitation of workers dislodged by industrial changes.

Sheet Metal Work

By William Neubecker. Cloth, 5¾ by 8⅝, 360 pages, illustrated. Price, $2.50. Published by the American Technical Society, Chicago, Ill.

This is a revised and enlarged edition of a book well known in school and in industry. It contains the usual instructions on methods of development and also gives many practical applications of the principles given. The book also embodies numerous problems of a geometrical nature, involving lengths, areas, volumes, weights, with which the sheet metal worker must be familiar.

Electrical Trouble Shooting

By A. H. Packer. Imitation leather, 5¾ by 8⅝, 558 pages, illustrated. Price, $4. Published by the author at 8130 Harper Ave., Chicago, Ill.

This is the third revision of this book. It has been brought up to date and contains revised and new sections on generator regulation, high-speed ignition, motor tune-up, motor testers, fuel pumps, gas analyzers, and auto-radio noise prevention.

The fundamental instruction on wiring generators, starter batteries, ignition, magnetos, test benches, storage batteries, armature and field testing, synchronizing and locating electrical trouble in circuits is, of course, included as in previous editions. A number of questions and answers have been made part of practically every chapter.

News Notes

¶ The first annual industrial inspection tours on the 1938 summer schedule of the Industrial Education Department of the East Texas State Teachers College at Commerce, Tex., was conducted on July 1. Professor J. G. Grove, head of the department, sponsored the trip and was accompanied by the following faculty members: Geo. W. Kibler, L. D. Keaton, Perry Fite, and Chris H. Groneman. Eighty students of the department and several visitors made up the group. The itinerary included the leading East Texas industries which were Rogers-Wade Furniture Factory and Cummer-Graham Box Factory at Paris; Kurth Lumber Mills, Clarksville; Soil Conservation Project, Bogota; Barrel Header Mill, White Rose Refinery, and Crockery at Mount Pleasant.

Due to the popularity and interest evinced on the first tour, a second one was made on August 11. This included the following North Texas industries: Southwestern Gasoline Pump Co., Bonham; Mrs. Tucker's Shortening Co., Pool Shirt Factory, Sherman Cotton Fabrics Mill, and Southwestern Machine Shops at Sherman; Denison Peanut Products Co. and Phoenix-Kraft Cheese Co., at Denison.

¶ The Advisory Committee on Education, Washington, D. C., has announced the publication of a report on the National Youth Administration, by Palmer O. Johnson and Oswald L. Harvey. Dr. Johnson is professor of education at the University of Minnesota. Dr. Harvey was formerly research officer in the National Youth Administration. He has been a member of the staff of the Advisory Committee since 1936.

The study by Johnson and Harvey reviews the student aid, youth work projects, and other programs of the National Youth Administration. In their summary chapter the authors conclude that "through the extension of educational opportunities to the underprivileged, the Youth Administration has uncovered a reservoir of competent youth desirous of continued education for whom almost no provision has been made in the past. It has demonstrated the possibility of providing educational opportunities at small cost which have proved of considerable advantage to the youth and to the institutions involved. And . . . it has increased school and college enrollments by 300,000 to 400,000 without sacrificing quality to quantity."

It is expected that a total of 19 staff studies will be published by the Advisory Committee on Education. Of these, the study by Johnson and Harvey is the first to be off the press, and copies are obtainable from the Superintendent of Documents, Washington, D. C.

¶ In order to assist chemistry and industrial-arts teachers in high schools, vocational schools, and secondary schools in presenting the chemistry of aluminum to their students, Aluminum Company of America has prepared a display chart.

On the front side of the chart, interesting scenes depicting the mining and manufacture of the raw materials used in the production of aluminum serve as a background for actual samples of the various raw materials. The electro-

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lytic cell in which the metal is made is also graphically illustrated, while the history of aluminum and its chemistry are briefly described. On the reverse side of the chart, a diagram traces each step in the production of the metal from the mining of the ore, bauxite, through the fabrication of the primary aluminum products.

The chart is 17⅞ by 27½ in. in size. It may be secured free of charge by teachers who will write to Aluminum Company of America, 2106 Gulf Building, Pittsburgh, Pa., on the letterheads of their schools.

Chart, 17⅞ by 27½ in., issued by the Aluminum Company of America, Pittsburgh, Pa.

¶ The Industrial Education Department of East Texas State Teachers College, Commerce, Tex., moved into its new quarters within the recently completed $200,000, Science and Industrial-Arts building in time to start the 1938 summer sessions. Additional new equipment in all divisions of the department has added further efficiency to instruction. These changes and improvements make this department a decided asset to the college, and place it as one of the leading departments of the south.

New Products

¶ The Cincinnati Grinders, Inc., Cincinnati, Ohio, are marketing the Microscope Aligning Instrument illustrated herewith. This instrument is designed specifically for aligning long Cincinnati grinding-machine beds. It consists of a cast-iron platen having a V and flat bearing, duplicating the table-bearing surface which contacts the bed. The aligning instrument will, therefore, be guided in the same path as the machine table. Mounted on the platen is a microscope, having an accurately divided scale across the optical field. This scale, graduated in half-thousandths, indicates the deviation of the guiding V-way from a straight line when readings are taken at regular intervals and on the same side of the wire. The wire is stretched tight from one end of the bed to the other, and forms a straight line for taking readings.

(Continued on page 20A)

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Elements of Electricity-Esty and Millikan	**2.00**
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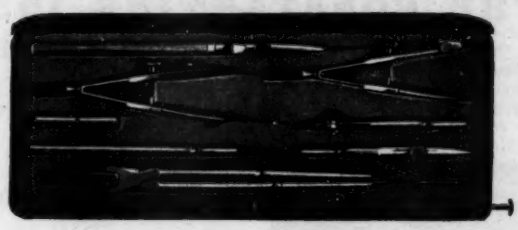

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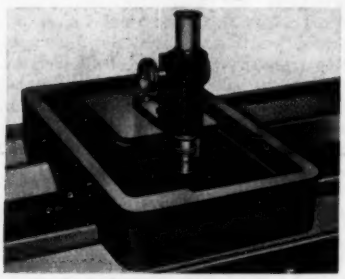
(Continued from page 19A)

Two-foot intervals are recommended for taking the readings. White paper placed under the wire at these intervals and a shield light bulb on a long extension cord, will greatly aid visibility. As it is best to use a new length of wire for each test, a reel of steel music wire, approximately 750 ft. long, is included with each aligning instrument.



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This method of checking alignments, commonly known as a "wire test," is an exceedingly close check on the basic straightline table motion for center-type grinders. It is the only method which gives direct, measured errors and permits positive correction.

¶ The Porter-Cable Machine Co., Syracuse, N. Y., has just announced the new Take-About Sander, Type T-ee. This sander is light in weight, yet is sturdy and has a powerful belt abrasive action for sanding and light grinding operations on wood, marble, metal, or composition materials.

Endless cloth-backed abrasive belts of any grit, 3 in. wide by 24 in. long are used on this sander. They may be instantly changed by means of a new fingertip lever arrangement. To assure proper cooling of the powerful ¾-h.p. universal motor that drives the belt, the frame is mechanically designed with front intake slots that permit the air ample circulation area to absorb and carry away the heat. The belt travels 1350 ft. per minute over the flat shoe, thus assuring fast, smooth results. A shoe pad is available for doing slightly curved surfaces, and a bench stand to hold the sander on its side, so that the front pulley may be used as a spindle sander, can also be supplied.

The machine is 4¾ by 7½ by 14¾ in. and weighs only 16 lb. It is extremely easy to handle and use efficiently. The equipment includes six assorted abrasive belts, and 15 ft. of rubber-armored cable fitted with proper unbreakable connecting plugs.

New Take-About sander

¶ The special values claimed for molybdenum steel have been developed by E. C. Atkins metallurgists especially for hack-saw requirements. Hack-saw users will find Atkins A-Mol hack-saw blades, trade marked with yellow ends, to be especially tough so that they can resist severe breaking strains.

These hack-saw blades are obtainable in 10- and 12-in. lengths for hand use, with 18, 24, and 32 teeth per inch.

The new hack-saw blade

There are 32 different power blades available in lengths ranging from 12–24 in., width from 1–2 in., and teeth per inch varying from 4–40.

The E. C. Atkins Company, 404 S. Illinois St., Indianapolis, Ind., will gladly furnish additional information on this new product.

¶ A newly designed cutter grinder, incorporating greater precision, efficiency, and convenience features, has just been marketed by R. K. LeBlond Machine Tool Co., Cincinnati, Ohio.

The new No. 3 cutter grinder is designed to greatly speed up sharpening and grinding operations. Seven distinct new features have been built into this cutter grinder:

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4. *Universal Table Position:* The special construction of the table makes possible the placing

(Continued on page 23A)

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(Continued from page 20A)

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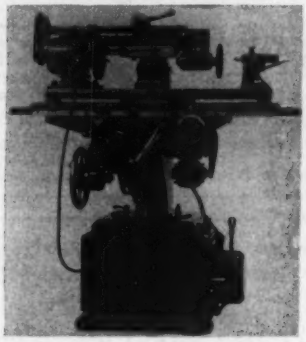

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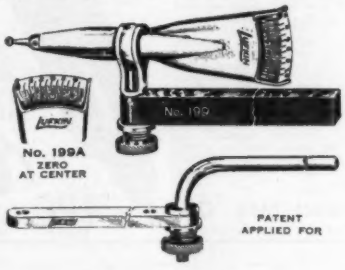

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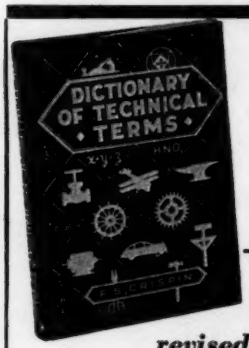

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